LEAVES

FROM A

JOURNALIST'S NOTE-BOOK.

BY

PERCY RUSSELL.

"KNOWLEDGE OF FACTS, APART FROM SPECULATION, IS THE SURE MEANS TO ALL SOCIAL AND MORAL PROGRESS."

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Dedication.

THESE CHAPTERS,

CHIEFLY RELATIVE TO DOMESTIC ECONOMY,

ARE DEDICATED

TO MY WIFE.

INTRODUCTORY.

HAVING, as a journalist, had various opportunities of personally inspecting many industrial operations interesting to every one, but, I think, now to many, I have collected a few of the most important, which are presented to the reader in the following chapters. Although no attempt has been made at scientific exactitude, the facts, as I hope the text will show, may be accepted as accurate. I have also tried to indicate, in some cases, the social bearing—too often overlooked—which the various industrial and commercial operations of the day have on domestic and individual life, and have endeavoured to describe correctly, as well as minutely, some of those manufactures and operations which certainly concern us all, but about which not a little ignorance generally prevails, and I shall be glad to find that these stray leaves from the mass of matter in my note-book meet with some encouragement.

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But, passing from fancy to fact, there is no question that the invention of the means for producing at will artificial light was one of the greatest eras in the history of human

progress. In the first place, it gave at once in temperate climes a very considerable extension to human life, and it is, indeed, difficult now to realize what life must have been in days when the setting of the sun at once put a stop to most human occupations, levelling man with the lower animals.

In the early history of mankind, the fire kindled for cooking purposes served of course as a light, and soon suggested the torch, leading by gradual stages to the germal original of the present candle. Here progress was indeed slow. For thousands of years germal candles, in some form or other, must have been used by all nations at all civilized. I include, of course, such contrivances as the floating wick in the cocoanut of oil common in Asia; but still it may be safely said that it is comparatively within the last few years that the representative candle has attained its present perfection, which now so greatly adds to the comfort, the beauty, and even the happiness of our ordinary life.

Candle-making is, to a certain extent, a chemical no less than a mechanical operation. The stearine—the solid constituent of tallow—has to be separated from the oil, and must be converted into a crystalline state by means of an alkali, and the employment afterwards of an acid before the base of the future candle is arrived at. The tallow comes, to a great extent, from St. Petersburg and Odessa, and very largely of late years from Australia.

Some candles are made from sperm, a substance found in the head of a certain species of whale, and paraffine is also employed, having a very wax-like look, and giving a good light.

Buried in the labyrinthine lanes of Upper Marsh, Lambeth, there is little in the external appearance of Messrs. Field's great candle factory to give any idea of the extent, intricacy and variety of the works within. A candle seems *prima facie* a very simple matter, and few perhaps, think that its history comprises chemical as well as mechanical phases, or that for its production in perfection powerful steam engines, enormous and elaborate presses, and a generally vast "plant" of a very costly character is essential, as well as the labour of hundreds of operatives.

Going straight to the engine-house, you find four boilers of great size; and in a side room is the machinery, in connection with the presses, for extracting the oil from the stearine. There is great economy of power here, as all the presses can be controlled collectively or separately from this one place.

The very commencement of operations may be seen by entering a very singular-looking building of vast extent, but somewhat shedlike character, seeing that one end is wholly open to the air. The various timber braces and the staging, which at one end supports immense vats, very like those you would see in a large brewery, are approached by a ladder, to be used with particular care, conducting to a platform, where the initial stage of candle-making can be seen.

Here are the gigantic vats, wherein the tallow is mixed with lime in order to destroy the glycerine which may be considered as a connecting link between the oil and the stearine. The great object of the candle-maker of course, is to obtain the stearine, because, until the oil is extracted thence no hard candle can be made.

Nothing can be imagined more hopelessly unlike the polished perfection of one of Messrs. Field's best candles than the curious-looking mass—resembling perhaps dirty-white earth—which is nevertheless the base of what is destined to issue from the mould or the handmaker's polishing table at last, it may be, a boudoir taper or an altar candle. The stuff in question is technically termed "rock." The next thing then is to separate the stearine from the alkali, after which the oil has to be removed. For the former purpose, sulphuric acid is employed; the latter is a much more elaborate affair.

The stearine has first to be congealed. This is done by running it into small tins about the size commonly sent to the bakehouse with batter pudding; and these, which, when full, greatly resemble that dish, are placed on horizontal racks, filling up the space within this vast building not occupied by the boiling vats for the initial processes. The effect of so many thousands of brimful tins, with only narrow avenues between, is very singular, and apt to suggest the sabbath nightmare of a hard-worked journeyman baker in a poor neighbourhood. So soon as the congelation is complete, the cakes are taken out of the tins and conveyed to a press-room where the oil is to be entirely squeezed away.

There are three great press-rooms. In the first that I entered are two large presses, standing upright in the middle. There are trap-doors in the floor; and on opening one you find that under the floor are great tanks, into which the expressed oil runs. The stearine cakes are laid between cocoa-nut mats, and these again at intervals separated by iron plates fitting into an upright frame, in order to prevent

the pressure from above causing the mass to bulge out. The press is then set to work. There is a gauge to guide the man who regulates the pressure; and while I watched the pile it was gradually yielding to a weight of three hundred tons: you could see the oil running out at the edges in mimic cascades clear as water. The stearine cakes come out with a clear impression of the cocoa-nut fibres on them, and begin to show some approximation to the substance of the candles they will eventually compose. Again, in another great chamber are the hot presses; and at length the pure basis of the candle comes forth in beautiful half-pellucid cakes, showing a crystalline edge where broken. Enormous piles of these cakes, of various sizes, are accumulating as fast as they disappear in feeding the pans, where they are once more melted to supply the candle moulds or the frames for manufacturing by hand.

On the ground-floor in another section of these populous premises are hundreds of candle frames. At the bottom are the spools around which are wound the wicks that ascend through a metal tube; while an outer jacket, as it were, enables a constant stream of cold water to be flowing over and cooling the surface of the new-formed candles. By turning a handle the spools unwind their wicks, and the candles slowly rise, being left at a proper height until their wicks are cut through and the batch is carried off. A vast quantity of water is required; and Messrs. Field have, indeed, found it necessary to sink a new well, in order to obtain a greater supply.

The effect is very striking here; the long vistas down the candle frames, with their regular rows of white candles, and the men and boys busy, some at the pans where the material is liquid and clear as water, some at the frames, and some carrying away crops of the newly-made candles, which have, as it were, grown out of the moulds—all this, together with the audible flow of the cooling water, furnish a pleasant picture not easily forgotten. There is something very clean about the whole process which is, perhaps, unexpected; and the regularity of the machine-moulding resembles the harmony of a good piece of music.

In another place are two admirable hand machines—a screw cutter and stamper respectively—for turning out the spiral and the coloured candles, and also those which are made to indicate—the hours, &c., being indicated by coloured figures. These novel clocks, which were, by the bye,

suggested by the crude original of King Alfred, are exceedingly pretty, and so obviously useful, that I should judge their consumption would, before long, greatly extend. The spirally-cut candles are exceedingly elegant, and are peculiarly fitted for the boudoir or the drawing-room. There is something, indeed, of a floral grace about these twisted candles which seems more in harmony with the naturally symmetrical form of the flame itself; much, perhaps, in the same way as one would rather see a rose or a lily on its natural stem than at the extremity of a straight stick, even were it of ivory.

There is, indeed, in the cable-pattern candles a very considerable utility, as well as beauty, in the fact that, practically there is no guttering; the twists burning to external points throwing the melted wax into the cups.

And, now, I must speak of the famous Ozokerit candles—a name that some time ago drove the more curious section of the public spasmodically wild when the mystic word first appeared in all the varieties of the most attractive of advertisement type. All along the history-haunted valley of the Danube, and even as far as the Caspian Sea, a strange substance is found in the earth which looks like common clay in its crude state; and which, under the name of Ozokerit, it was the good fortune of Messrs. Field to to manufacture into a candle which at once surpasses sperm, paraffine, and wax in all the points essential to the economy, utility, and beauty of a candle. The great merits of Ozokerit are hardness, admitting of a beautiful polish, a perfect cup in burning, and the highest melting point by far of any candle yet manufactured. While wax melts at 140°, Ozokerit does not begin to fuse until exposed to a surrounding temperature considerably higher. This alone is a very important advantage, and of immense value in hot climates, where, as costly experience often shows, ordinary candles grow suddenly supple and weep destructive tears over ladies' dresses, and sometimes, as at tropical balls, smother uniforms without distinction of rank.

Few things can be much more at variance with one's normal idea of a good candle than a lump of this dull-looking substance, whence comes, however—

> Full many a shaft cast in artistic grace,
> Smooth as the kiss of pansies face to face;
> Soft to the sight, though to hot skies they turn
> Hard fronts that seem to melt not while they burn!

Wherever people can choose between candle and candle so

as to have the best considered on their actual merits as lighting powers, I cannot doubt that Ozokerit will carry off the palm in all cases. It is the prince of candles, in fact; for it gives a beautiful light, while it more nearly approaches to a piece of hard half-pellucid ivory than I could have imagined any form of suitable material ever could. Indeed, many of the higher-priced candles are well entitled to rank high, even as works of art. There is in particular a fluted pattern like a Corinthian column which shows how much beauty a touch of sculpture can impart even to a candle, while some of the more delicately tinted kinds seem all that the most fastidious could desire for the banquet, the card-table, the piano, the boudoir, the ballroom, or—for aristocratic students—the study.

The manufacture of the Star night-lights is also a very interesting section of these works.

Large copper silver-lined vessels contain the material as in the candle-works. Here a batch of clean, bright-eyed, nimble-fingered boys are busy inserting into the empty pasteboard frames those little morsels of tin which we find at the bottom of our night-lights after they have burned out; there others are placing the wicks; while again rows of the little workmen have trays before them of the frames already provided with their tins and wicks, which they fill up with an astonishing rapidity and precision by simply pouring out the liquid matter from a kind of pot, much in the same manner as one might pour out cream into an army of marvellously closely marshalled lilliputian teacups. The rooms in this factory, which lies near the river some way past Lambeth Palace, are light and airy; the labour is agreeable, and the variety of occupations connected with the manufacture of even a single night-light prevents the work from becoming monotonous. There are six or seven distinct processes from beginning to end before the article is finished, and by confining each boy to one of these at a time an astonishing degree of celerity is attained. The wicks, which are prepared in the same way as those for candles, are cut into the desired lengths by placing them by large bundles into a wooden gauge and cutting them off in successive batches, as they are thrust forward the requisite distance, by a kind of guillotine knife. All the while that the tins and wicks are so swiftly accumulating at the initial stage of the manufacture numbers of boys are packing the finished night-lights into their boxes, and judging from the energy with which the piles of the

finished articles accumulate, one might well suppose that here at least production would very soon overtake consumption unless one came to the conclusion that it had suddenly grown a British habit to sleep with a light at all times. Here I saw some wax night-lights of a very solid breadth, expressly manufactured for the Queen, and well worthy of the honour of shedding their soft and steady light on one

> Whose sleep is taken on the nation's breast.
> Whose life as Widow wifehood sanctifies;
> While in that Throne-glow household love hath blessed
> The lowest subject sees in beauty rise
> Those virtues pure which make 'neath Heaven's dome
> Each husband priest of that true church—the home!

I have spoken of the singular whiteness which renders some of Messrs. Field's candles so conspicuous for the beauty of their tone, and furnishes so fair a shaft to a steady, clear, and vivid flame. In order, of course, to attain such purity, it is necessary that the wax should be well and carefully bleached—an operation formerly conducted at Lambeth. These factories, indeed, have been established in the Upper Marsh for so many generations that it is, I judge, highly probable that the antiquity of Messrs. Field's works might even carry us back to a period anterior to the Reformation. At all events, there is something highly suggestive in candle-makers having planted themselves so close to the Abbey: and it is likely enough that in days when a large wax candle was a special triumph of manufacturing skill, some of Field's went far to relieve that dim, religious light which makes the storied shrines and stately aisles of Westminster Abbey such solemn monuments of the very grandest of historic pasts.

This, however, as it may be; my business is now to describe the method whereby the wax is whitened and finally prepared for the candle-makers. Admirable as is in so many respects the internal economy of the works of Lambeth, it was to me a pleasant change, after a green railway run to West Moulsey, to find myself approaching the bleaching grounds of Messrs. Field, which are situated not far from Hampton racecourse. Passing through gates very like those of a farmyard you find yourself within a large open space inclosed by trees, and on one side a long range of wooden buildings; the factory, in a word, where sundry indoor operations are conducted—if, indeed, one should use the phrase indoor at all where all is so fresh and sweet.

Stretching away from the factory front lies the open

bleaching-ground itself. This is of great extent, and beautifully walled in on one side by fine chestnut trees, harbouring a number of pigeons. The space is filled by 124 great tables, arranged in parallelograms, with sufficient space between them for a man to wheel a barrow, rising some foot from the ground, with high rims like deep trays, and covered with canvas cloths. These cloths are so ample that, when necessary, the overlapping edges can be made to meet in the middle so as to completely cover whatever may be laid upon these tables. Spread loosely over these canvas beds you see what seems at first sight masses of shredded blossoms, exhibiting every shade that passes from the intensest yellow to the most virgin white of the delicate lily. This, however, is the wax bleaching or already bleached by simple exposure to air and light. As you glance down the tables you can see, in vista, the process in all its stages. There are few things prettier in its peculiar way than this field of gold toned off here and there into the dazzling whiteness of the fresh snow-flake, with its surrounding framework of green, its lofty chestnut trees, a summer sky, and the cool sweep every now and then of a flying pigeon.

But I have to explain how the wax comes to have this appearance of shredded flowers before it is submitted to the whitening influence of fresh air and pure sunshine.

In one extremity of the factory you find a store-chamber, containing the beeswax from Australia and Africa and India in its crude form, in some instances drenched with dross, in all respects totally unlike the light and graceful flakes of gold which are first submitted to the action of the bleaching grounds. The piles, indeed, of wax cakes, chipped and broken, resemble, as nearly as anything I can think of, a heap of broken and damaged stoneware, and no one unacquainted with the manufacture of wax candles would suppose that here they saw the staple itself of many lights whose destinations are palatial.

The wax is melted in a series of enormous vats, raised on a stage at the extremity of a long room. The melting is effected by steam. A coil of piping is inserted into each vat in connection with a steam-engine that here does all the work of the factory requiring such power, and the wax is gradually liquefied from the bottom upwards. It looks very dark and dense on the surface when in this state; but, on inserting your finger, you find it adhering thereto, a bright gold colour perfectly free from dross,

The vats filled with the liquid wax form the head of a capital T, so to speak, the stem being a long water-tank extending from the foot down the centre of the room. There is a trough in front of the tanks with a perforated bottom; so that on turning a tap as the liquid runs in, it escapes in a number of perfectly regular threads. Now at the head of this water-tank is a wooden wheel turning by a handle, and so nicely adjusted that as the several threads of melted wax run through the perforated trough, each strikes the upper portion of the wheel, or rather cylinder, at such a line as to throw them off in buckling lines down the back. The handle is turned by a man, and as the wax flows over the hinder part of the revolving roller in distinct streams, or rather threads, each strikes the surface of the water just below, and is drawn forward under the cylinder at every revolution. The threads are thus drawn forth in ragged ribbons resembling long strips of perfectly golden seaweeds sweeping down the heaving water, and a few revolutions of the water-wheel soon fills the tank with a glancing mass of what perhaps most resembles a troubled heap of yellow blossoms. At the end of the tank a man stands armed with a great wooden rake, and as the shredded wax comes sailing down he reaps it off the water in great heaps and rapidly fills baskets, which are lifted into wheelbarrows and immediately wheeled out to the bleaching-grounds where the contents is lightly strewn on the bleaching-tables.

It is as pretty an occupation as I have ever seen. There is something particularly refreshing in the ceaseless rush of the ragged ribbons of deep yellow as they emerge from under the swift-turning cylinder and flow down the agitated water, while no one who saw the rakers gathering in what may be truly termed their floral harvest, would ever suppose that here they beheld one of the most important stages of candle-making.

As soon as a crop has been levelled on one of the tables, it is left to the natural action of air and light. When the surface is white it is necessary to turn the under portion uppermost, and once again the table bears a golden load. It is curious that when a certain degree of whiteness is attained the process suddenly stops, and it becomes necessary to melt down the partially-bleached wax, run it into cakes, melt it in the vats, convey it through the perforated trough, and tear it into long shreds between the wheel and the water, and again spread it out to the subtle influence of the summer light.

Rain does no harm to the bleaching process. The only thing feared is a high wind, which might scatter the treasure of a hundred tables far and wide. It is to prevent this that the ample cloths are made large enough to turn over, and men are perpetually watching, so that directly a high wind rises the whole of the tables are placed in safety under the protecting canvas. They are rich tables, indeed, when loaded with wax, and under each is a basket, so that as the water drains off through an orifice any loose pieces of wax borne down with it are saved and melted down for another bleaching harvest.

It may be supposed that such an occupation as this is popular as well as healthy. I never saw workmen look better, and can quite understand how a spell at the bleaching-grounds is regarded by Messrs. Fields' men as almost equivalent to a holiday in the country. The process goes on as a rule from April to September. During the rest of the year the bleaching-grounds are closed, as a foggy air would render it impossible to carry on the process which is, to so great an extent, performed by Nature herself.

I am sure no one who has once seen the wax come up from under the water-wheel will ever forget the sight; while at the same time one cannot forbear from dwelling on the industry and numbers of those unpaid operatives who unconsciously prepare one of the staples of Messrs. Fields' manufacture far away in African wilds and Australian solitudes—the bees.

DOMESTIC LABOUR-SAVING MACHINES.

ONE of the most striking and encouraging characteristics of the age is the fact that inventive genius is no longer confined, as it once was, to war, politics, and literature. Putting aside a few great masters of mechanical invention, it is only of comparatively late years that any great degree of intellect has been brought definitely to bear on the more minute, but not on that account the less vital details of our domestic life. The effect has been to introduce into the very innermost recesses of individual life among us, advantages equally great with those the public enjoy by means of the steam-engine or the telegraph.

There cannot be any doubt that by multiplying the conveniences at home, and discovering short methods for performing all its mere drudgery, life itself is lengthened and rendered incomparably happier. At any rate, such notions are irresistibly suggested by a visit to a factory like one which now stands in Holborn,—an exhibition in itself of useful industries,—Kent's manufactory of domestic labour machinery.

On entering we are in the midst of a mass of domestic machines of all kinds and sizes, and opposite an avenue leading to an interior court-yard, rising to a glass roof, forming a gigantic shaft with its four walls all windows lighting the successive floors through which it passes. Behind this interior floorless tower is the driving-wheel of the steam-engine, whence emanate all the automatic

powers of the establishment. A spiral staircase leads from floor to floor; and emerging on the roof at a height muffling the roar of Holborn, you can look down at the back on a striking sight, viz., piles as big as small houses of empty crates and cases that have done duty in bringing raw materials to this industrial mammoth, which devours leather by the acre, screws by the hundred thousand, iron by the ton, and wood by the load. On the top floor, the number of the carpenters, and the character of the work might make you think a portable village for the colonies was constructing. It is, however, only the frames of refrigerators that are here making, and this leads one at once to one of Mr. Kent's many useful inventions. Originally refrigerators were constructed on the hermetical principle, and manufacturers were astonished to find the method invariably failed when severely tested as a preservative of food. The problem to be solved was how to induce a continuous stream of dry cold air upon what was to be kept fresh and sweet, and particularly to insure the practical annihilation of that germinal life which more or less ever floats around us in the air itself. Now it must be remembered that cold air inevitably descends, and the old plan of putting ice beneath whatever had to be iced led to this result, that air sufficiently heated to effectually contaminate whatever was exposed to its influence was always floating where it had no business to be. Mr. Kent's principle may be called that of the persistent, downward, ice-cold air current. His safes, whether of a size for the smallest family or largest club, correspond in this. Each has an orifice in the lid through which the air naturally falls on the ice itself. The air is ice-cold, condensed, and thereby rendered very heavy; it falls through gratings on the opposite corners of the interior as surely upon the entire area below as a flood of water would, and issues from the bottom of the safe. It is obvious, then, that the cold air cannot stagnate before it leaves the ice-chamber above, whence it derives that weight which gives it motion, while at the same time the intensity of the freezing force applied has deprived the air of any germs of organic life it may have previously contained. No taint can, therefore, be imparted to whatever description of food is deposited within. The ceaseless downward current of antiseptic cold effectually prevents the medley of flavour so common and so objectionable whenever ordinary refrigerators are used for

icing articles of naturally antagonistic natures. This frozen current, too, maintains a powerful drying tendency in the safe; all the air gravitating downwards is as dry as it is pure, while, once at the bottom, it must immediately give place to a fresh descending body of newly-iced air. This desiccating cold also carries away from the articles within all noxious gases and impure moisture that may evolve. Fresh fruit intrusted to this receptacle retains its bloom and flavour for days, and it is a fact that strawberries may be shut up with onions without the former receiving the slightest taint from the latter.

Mr. George Kent, indeed, has done so much to develop the domestic and hygienic utilities peculiar to ice, that he may be aptly termed the chemist of cold. Kent's Improved Rotary Ice-making Apparatus for producing pure ice, is a handy, portable, and convenient cylindrical vessel, with a handle, whereby, in the lower division, something like the miniature paddle-wheel of a steamer can be put in motion. With a little freezing powder, and a trifling expenditure of muscle, a few pounds of ice may be made in as many minutes. By removing this kind of paddle-wheel, and introducing the freezing-pot and spatula, ice creams can be made, also wine cooled, as readily as with the ordinary apparatus. The advantages of such a machine are obvious; and it would be invaluable were its only use that of producing ice-creams, or ice, on an emergency in cases of sudden illness. There is no antiseptic like cold, and in many ailments the constant application of ice may be a matter of life and death. There is also another kind, as the Rotary Freezer made double; one action of a crank-handle operates simultaneously upon two freezing-pots, so that, if required, two different kinds of ice can be made at once. Then there is the Domestic Freezer Apparatus; this makes water-ices and freezes creams. Nothing but rough ice and salt are required.

I must now speak of a freezing-machine, which is in all ways a marvellous advance upon all preceding mechanisms designed to produce ice. By the old process, either the pot was made to revolve round the spatula, or the spatula revolved within the freezing-pot; in either case there was always a space, however slight it might be, between the blades of the spatula and the sides of the freezing-pot, and this, while involving a waste of power, invariably prevented the freezing from being of an uniform character. There was

also an utter inability to combine the two methods in one machine, although each had its special advantage—when the pot revolved round the spatula, the freezing was more efficient and rapid, and when the spatula was made to stir within the freezing-vessel, then the mixing of the ingredients used, say in making coloured creams, were perfectly blended together in a manner unattainable by other means. Both these great advantages, however, have been combined, and others added by the substitution of a horizontal for the old vertical position, and the addition to the inclosing bucket, wherein is placed the freezing compound, of certain mechanical contrivances. In the case of upright buckets, there was always a strong tendency for the ice or ice-cream to run down, while it is obvious that the horizontal position insures an evenness and regularity in the process not otherwise to be achieved. As the tub revolves, the freezing compound is borne to each side and washed over the freezing-pot with the utmost regularity—in itself an economy. By a simple mechanical adjustment the freezing-pot can be made to turn round the spatula, thus insuring quick and sufficient freezing, and at the same time by shifting the handle, the spatula can itself be made to stir round inside the freezing-pot, thus insuring such perfect admixture of all the ingredients within, that raspberry creams, for example, can be produced of an equal tint throughout. By means, too, of an india-rubber band the spatula is made to exactly fill up the space inside the pot, and thus the inner surface is thoroughly cleared on each revolution, a thing that never could be effected by the old method. The beaters, too, being tinned and not galvanized, are quite unaffected by whatever acid may be employed in making the creams, and thus there is no chance whatever of their acquiring any metallic flavour. The whole of the external iron-work of the bucket, &c., is galvanized, moreover, and those who know what rusty freezers sometimes are, will fully appreciate the value of this little detail. The tub itself is closed so tightly that no water can possibly escape from it, and this also prevents any waste of ice from atmospheric action. Then there is an immense saving of labour and power, while the economy of time is very great indeed. There can be no doubt whatever, this new horizontal freezer is in itself the compendium of all others, although embracing these advantages, it has none of their faults, while it possesses great merits peculiar to itself.

Coming to the more peculiarly domestic sphere, we find tnat Mr. Kent has invented a machine for washing which combines in the same degree the simplicity and thoroughness of the best possible hand-washing, with a marvellous economy in expense and time, and an almost automatic perfection in detail. A concave corrugated wood bottom coincides with a similarly corrugated cradle, to which a simple handle communicates a rotary motion. The protuberant lines of woodwork reproduce when working as nearly as possible the precise action of the human knuckles when washing clothes in the usual way. Although this machine can be effectively worked by a child, it is undoubtedly the fastest washer in existence. Like the Nasmyth hammer, it deals equally well with the great and the small, and while the most exquisite lace may be safely intrusted to this practical automaton, druggets and counterpanes are dealt with quite as easily as towels and handkerchiefs. These admirable machines can be made of such dimensions as to suit the most extensive laundry, and worked by steam power, accomplish wonders. When we consider that one of the smaller kind, about 28 in. wide, will do the entire washing of a small family in three hours, without steam, effluvia, or drudgery, it seems a pity that a washing-machine is not to be found in every house. An ingenious auxiliary to this is a wringing-machine, which, while it spares the laundress one of the most injurious operations connected with washing, actually performs the work far more effectually than it could be done even by the iron wrists of the professional athlete. India-rubber covered rollers revolve by means of a handle. The clothes are just passed between the rollers and fall into a basket placed for their reception. Coarse or fine, whatever the stuff may be, it is all the same. The fabric is never injured; a saturated sheet of paper may be wrung without a crack. Thus the fibres of the linen, for instance, are not damaged as by ordinary wringing, while the number of sprained wrists spared by this process is surely worthy of all consideration. Ladies, too, will appreciate the fact that this machine starches skirts, &c., to perfection, since by its even pressure an equal amount of starch is distributed throughout the texture. But even these machines are perhaps surpassed by the patent ironing and mangling machine introduced by Mr. Kent. No larger than a small Pembroke table, the smaller ironers consist of a roller working over a metal slab heated below by perforated gas-pipes, and turned by a handle. It is as simple

to look at as it is astonishing in its results. The roughest cloth will emerge with a satin surface from the revolving drum. In a word, this invention stereotypes and multiplies to an almost unlimited degree the utmost skill of the cleverest ironer. Weights regulate the pressure of the roller, and such is its power that articles come forth with a surface like highly-finished note-paper. Worked by steam, these machines perform prodigies of labour, and one of them can turn out sufficient linen to supply a small town within twenty-four hours. It may be imagined what a blessing this invention has already proved both in private homes and public laundries. It may be added, too, that damasks are greatly beautified under a process which brings their patterns into a bold relief not to be obtained otherwise. These machines, too, may be heated either by gas, steam, or a common coal fire; in the latter case, the grate is constructed beneath the hot plate, while the smoke is carried off by a side pipe. Gas is applied as described above, while in larger machines the steam traverses a coil of heated pipes. Certainly these inventions have reduced the labours of the laundry to a minimum, while attaining results totally beyond the reach of manual toil. The completeness with which this,—one of the most important sections of household economy,—has been dealt with is evidenced by the fact that even a matter seemingly so simple as that of drying the clothes after washing has not escaped Mr. George Kent's attention: his clothes-dryer has an upright pole from 10 ft. to 13 ft. high, and by means of a pulley at the top of it can be made to throw up arms umbrella fashion, and is fixed in a moment in almost any place. As the machine revolves, every line may be easily filled by one person, without stirring from the foot of the standard, and although the dryer gives an area for hanging space of about 150 ft., it does not when folded take up much more room than a large carriage umbrella. The dryer, too, can be used indoors as well as out, and may be erected in the midst of a bed of flowers without disturbing them in the least. In this comprehensive series of labour-saving machinery are strikingly shown the benefits, physical and moral, necessarily derived from the annihilation of those kinds of toil which convert the workers into mere implements.

Then there is the knife-cleaner, a kind of drum set on scroll legs of ornamental iron, and provided with a large handle and orifices in the upper rim, wherein the blades to

be cleaned are inserted. An admirable and thoughtful contrivance of Mr. Kent's—in the form of an index—renders it impossible for the knives to be cleaned when wrongly fixed, while a little grooved wheel effectually prevents the edge of the knife from being blunted. The interior is filled with brushes arranged in a sun-ray form round the revolving disc. The leathers themselves are supported by exceedingly strong india-rubber. The knife first passes over the brushes and then over the leathers, which are so strongly backed up that they never get out of their proper places.

The utility, strength, durability, and economy of these machines are now so universally known that it is quite unnecessary to expatiate here on an invention which, had it been alone in the long roll of Mr. Kent's achievements in saving domestic labour, would have made its inventor famous in that particular and laudable part of practical reform he has so persistently followed.

THE SEWING MACHINE.

IF asked to supply a fresh definition for civilization, I think my answer would be—it is life which subordinates to itself the greatest amount of machinery. How far machinery may ultimately supersede those forms of labour which are now justly regarded as wholly unproductive to society, and of little or no permanent advantage to the immediate doer, is an interesting question for the study of the philanthropic political economist.

It is not, of course, my intention to pursue at present this suggestive inquiry into the region of even the most attractive and humane fancies. My business in these chapters is simply to show as clearly as possible how far machinery has yet advanced in certain domestic directions, upon what I believe to be its benign errand of mercy to man, in giving him, without distinction of class, a wider dominion over the earth and its fulness.

What shall we say, then, to a machine which, at the expense of an effort no greater than that involved in an easy saunter across a well-kept lawn, without trouble of any kind, and needing no costlier fuel than that which produces the strokes of the human pulse; performs, in almost perfect silence, such an amount of necessary household work—at so slight an outlay of time and muscle—that the day grows longer than a week, and it becomes possible, by the aid of this miraculous machine, to win even months of time for other things which it had before been physically impossible to do.

Of course all my readers are more or less familiar with sewing machines; but I am greatly surprised, knowing what

I now do of these machines, that their use is not so much greater than it is, by whatever extension may be required to render that use universal. I am going to explain why.

Some time since I carefully inspected a vast repository of machines in Cheapside, where one sees, in effect, one of the happiest means for conferring on household life almost every benefit that additional time can bestow. My interest was not so much excited by the truly wonderful application of these machines to manufacturing purposes as by the conspicuous advantages they necessarily bring to the homes of the nation.

In every household there must necessarily be a great amount of sewing. There are three ways in which this can be done:—It may be put out; hired assistance can be had in the house; or the family themselves may do the work. In the two former cases, the money paid for the work is evidently withdrawn from other purposes to which it might have been applied, and the rate of payment is so low that the employer can feel no pleasure in the questionable encouragement afforded to a peculiarly painful, dismal, and tedious form of female labour; while, indeed, in many cases, as we often see, such ill-paid work is the direct cause of direst misery, want, and even crime.

How many of us know homes in every respect deserving to be held in the highest estimation, where, at least some members of the family spend day after day in unremitting application to the painful needle. There are clothes to be made for this child and that one, and what not besides; and as there is mending as well, leisure too often vanishes for ever from far too many among us after marriage, and sometimes long before. Now with a sewing machine a plain dress may be made in two or three hours! The effect on labour and leisure is obvious.

The most agreeable feature, perhaps, of my visit to the City establishment of Messrs. Willcox & Gibbs was the practical initiation I there received from a lady in almost every description of work that is ever likely to be required in the ordinary routine of household economy.

These machines are, in the first place, capable of being adjusted with either a treadle or the hand movement; but, except in some cases where the latter form is decidedly inconvenient, I cannot myself understand how any one who has once experienced the case, smoothness, beauty, and precision of the foot-movement, can ever consent to grind

away, organ-like, as some of my friends do with a tiresome hand-machine, producing, by the bye, anything but pleasant music when they operate on machines which, unlike these, are exceedingly noisy, whatever their other merits may be.

It occurred to me, too, that many people probably forget, that whereas the right hand only can be used in turning the handle, either foot may be employed in using the treadle; and the exercise is decidedly a pleasant one, with little or no feeling of exertion about it; and if the self-sewer be used both hands of the operator are free; so that the foot and the eyes are alone engaged, while all passes on with the most perfect, quiet, celerity, and exactitude; the work, in fact, very nearly does itself, and that in a manner which no mortal could imitate in even one particular with the old-fashioned needle.

Among many other points of very decided superiority which I noticed, is the ingenious heel of the looper, which renders it impossible for the stitch to slip off while in process of formation. The needles, too, being of the same length, with identical shanks, the setting is no longer at all in the discretion of the user, but cannot possibly deviate to the right or the left, as it often does with other machines.

The rotary movement is communicated to a shaft with two eccentrics, whence three movements proceed, namely, the revolution of the looper, which enters the loop formed as the needle rises, the action of the needle itself, and again that of the feed, which carries along the materials sewn.

Certainly it is no exaggeration to say that the utmost possible human ingenuity has been concentrated here with one object in view—namely, that of leaving as little as possible to the judgment of the worker—if that word be at all the fit one for her who guides so swift and graceful an automaton.

As the lady who exercised the machine before me very sensibly remarked, those persons who made it their sole pursuit and study in life can of course manipulate the machine with perfect safety under all circumstances, without resorting to the aid of mechanical guides. But the majority of those employing these machines in their own homes for domestic purposes only, naturally desire as little trouble as possible; and it is quite safe to say that no poor hard-worked needle-woman in the dreadful times when there were no sewing machines at all—except human ones—could ever be depended on like one of these. Nothing more positively is required but to place and hold the work; while the quickness with

which it is done takes away—I should think, if my lady readers will, in these liberal days of woman's rights, allow me an opinion on such a topic—every sense of tediousness naturally incidental to the operation of sewing with the ordinary needle.

It is, I am convinced, not too much to say that the lady who takes a comfortable seat at her sewing machine, working the treadle with her foot at an effort costing little more exertion than that of speaking, has made a very much greater advance upon the old painful method of sewing, which chafed the fingers, soured the temper, and, long persisted in, crippled the body, than even the traveller by railway has on those who went by stage-coach.

Among the many advantages which the machines fitted to their own proper tables have over every other kind for household use, not the least is the convenience thus offered for converting the whole into a handsome and capacious cabinet. The entire frame, as well as the top, is completely inclosed; and thus a lady not only has the means of making her sewing machine a very pretty or even a really beautiful piece of furniture when unemployed, but she can keep inside not only its own proper attachments, &c., but even the usual contents of a work-basket in a neat and well-ordered manner.

And even the placing of the work may be mechanically done. I had the pleasure of seeing the hemmers perform their task with mathematical precision, while the quilter quilted up some wadding in a manner calculated to make one feel exceedingly comfortable—had the day not been quite so warm.

The name, "Lock-Stitch," exerts a considerable influence on the minds of those who are not well informed on the subject of sewing machinery. The lock-stitch, as no doubt very many persons have long since found, requires for its production comparatively intricate machinery, which is difficult to master and liable to derangement; and the sewing resulting from such complex machinery, while requiring far greater skill in the operator, is in some respects decidedly inferior to the work of the simpler Willcox & Gibbs. More especially is this true wherever it is found necessary to alter or re-make garments; for while the lock-stitch is almost as troublesome to undo as it is to make, the Willcox & Gibbs stitch can be removed when required without injury to the fabric. The unpicking is, however, a

matter entirely dependent on the will of the sewer, as the seam may be severed by cutting across, and even then the work will not run. But, besides this, after witnessing a variety of hemming of different kinds, I had the curiosity to cut them into sections, and try how much strain they could bear without going to pieces. To my astonishment, the work in all cases withstood a considerable amount of tearing, and in one instance the stuff itself gave way before the severed sewing. Now the lock-stitch parts easily under similar circumstances.

In order to try the machine to the utmost, a piece of stiff calico, with several folds as an abrupt excrescence upon it was made to pass under the needle, which stitched the whole as though it had not to rise suddenly some eighth of an inch; a feat which, on the easy terms of an incline, I am assured by many friends frequently breaks the needles of other machines. As though to show how perfectly everything that hands, scissors, and ordinary needles have hitherto done may be accomplished by machinery, there is even a needle contrived expressly for making fringes. It performs its office so beautifully that two pieces of ribbon may pass together under the needle, so that you get a double quantity of fringe—any width desired—at one effort. Then again the needles scarcely ever break. One reason for this, I can plainly see, is the fact that they are short—an obvious advantage. They have also a turn as they pierce the stuff, giving them a screw-motion, which adds to their penetrating power.

On the whole, the impression produced by a ramble through this vast laboratory of—it is hardly too much to say—leisure, independence, good-temper, and even household happiness, is a very pleasant one. I am Positivist enough to believe that the sewing machines of Willcox & Gibbs can manufacture moralities as well as dresses; and I do not think they can ever fail to bring benefits far beyond those for which they are immediately acquired into every home, where for the first time they come—often indeed,

The gentle and the meek to free
From toil they need not bear:
For labour is but liberty,
Not suffering, want, and care.

ECONOMIC STOVES.

IN these days of popularized science, few persons need to be told that motion is a necessary condition of heat, and heat of life. The human organism has often been likened to a fire, and the food that we eat to its fuel. It is true, indeed, that only a portion of our food is, strictly speaking, to be classed among heat-givers; but it is no less true that, by some means or other, the heat of the human body must be maintained; and whether this is done by food or fuel, the end in view is still the same. Thence, indeed, it is that there is little practical difference between a rise in the price of coal and one in that of bread. Where there is little fuel there must be more food to produce the same quantity of vital energy, and however cheap bread may be, that cheapness can be effectually neutralized by the dearness of coal.

That all, except the very affluent, are more or less affected by these economic considerations is evident enough; and, as far as I can see, the unlucky middle classes are the great sufferers at present. Successful "Strikes" have raised wages generally, and thence prices, while the capitalists again have come down upon the unfortunate middle-class consumers and made them, in most cases, pay whatever has been reluctantly conceded to the pressure of Trade Unions.

Under these circumstances it is, I think, clear that whatever relates to the economy of fuel naturally deserves careful attention from all, and that the more so when we consider that whatever may be the truth respecting the

national stock of coal, the more that stock is economized the less costly will be the process of obtaining the necessary supply; and it is an axiom in sociology that whatever can be saved from the purchase of actual necessaries will generally be expended on other things; thus leading to the more harmonious development of society in all its proper functions.

There can be little doubt, I think, that the evil is, in great part, owing to the fact that nothing, perhaps, of equal value of all that we use in our homes as a prime staple of daily life is more systematically wasted than coal. An inquiry that I have been able to make into the practical part of this question is therefore, I fancy, both seasonable and interesting—at least to all householders.

In one of those tower-like structures that rise at the Ludgate Viaduct side there has been for some time past a somewhat remarkable establishment with a spacious window, where iron kitchens in epitome, as far as cooking goes, can be seen in full operation—the actual food alone excepted.

There is a handsome show-room filled with a well-arranged exhibition of stoves of all kinds. A gallery similarly furnished runs round the lofty premises, and completes a very compact and intelligible summary in iron of all that invention has yet done to economize the consumption of fuel and render cooking not only easy and cheap but agreeable also. Here, indeed, are the results of the Glasgow Ironworks of Messrs. Smith & Wellstood, where four or five hundred hands are constantly employed solely in manufacturing these improved and economic stoves.

The two principal kinds relate to the kitchen and sitting-room. Of the former kind the Victoress Kitchener, as it is called, is representative. Within the limits of an ordinary-sized trunk, and of a construction admitting of the same freedom of carriage, this ingenious stove is internally and externally a marvel of contrivance and adaptation. Every inch of space is cleverly utilized. Within the narrow limits of a width of some two feet, a depth of three, and a height less than two, there is at once an excellent and capacious oven, a large boiler, a grate for roasting, and a first-rate hot-plate. A number of culinary and household operations depending on fire can be carried on simultaneously, and that without confusion, and much more efficiently than at the ordinary kitchen range.

These kitcheners, too, are absolute remedies for smoky chimneys. The pipe to carry off the smoke is simply put up the chimney, and the whole may be placed where the grate is usually set, or it may stand out in the room. There is no need of bricklaying at all; the kitchener merely requires to be put in its place like an ordinary table or chair.

By the addition of valves the fire can be regulated to a nicety, and rubbish will burn well in the inclosed fire-chamber, where a pound only of coal will accomplish wonders. There is positively no heat wasted. All is utilized; and the compactness and neat appearance of these admirable substitutes for kitchen ranges need only to be seen to be approved. As to the stoves designed for sitting-room purposes, such is their appearance and action that I cannot but think that they possess very decided advantages over the common form of open and necessarily extravagant grate.

In the first place you can, when you please, have the fire-place open, and exactly like any other; you can close the bottom—from the hearth to the lowest bar—by means of two pretty iron sliding doors, and thus have a slow fire; you may shut similar doors above, and get heat radiated from a thoroughly close stove; thus rendering the fire perfectly safe at night, as in the case of a bedroom; while, by opening the lower and shutting the upper doors, in a very few minutes a moderate amount of even very poor fuel will produce, if you desire it, quite a furnace on a small scale.

No heat is wasted, the fire is entirely under control, and even rubbish will accomplish more in these grates than the best coals can in the ordinary open fireplaces.

The tops of these stoves are in many cases made very elegantly. Some of them culminate in flower-like scrolls, and altogether they are usually in their designs in harmony with the graceful convolutions of that familiar epitome of elegant curves—an ordinary flame.

The expense of these stoves, in all cases very moderate, is a really good investment, far better than a share of nine-tenths of the public companies that have been registered for some years at the rate of at least ten a week. The saving begins from the first day of using, and represents, in the case of the larger sizes of the "Victoress," a very considerable annual amount. Unlike the majority of joint-stock investments, the purchaser is certain to get his whole capital back again and a handsome dividend as well.

Some time ago the well-known Clyde Ship-building and Engineering firm, Messrs. Robert Napier & Sons, anxious to be up to time in their completion of a large Government war ship, were so energetically seconded by their thousands of workmen employed on it, that on the successful termination of labour on the great vessel a liberal recognition of the men's hearty good-will in the work was determined on by the firm.

Not in any huge bacchanalian feast of eating and drinking was this carried out, but with that wise practical originality of thought always so conspicuous with Mr. James R. Napier, he, in the cases of some thirty-eight of the foremen of departments, ordered Messrs. Smith & Wellstood to fit up in each of their houses one of these excellent Kitchen Cooking Stoves with all its conveniences; and a better-appreciated or more appropriate token of kindly consideration for the home comforts of the better class families amongst their men could scarcely have been conceived; and borrowing a hint from the more sensible practice now prevailing in the case of valentines, I certainly think that few better Christmas presents could be made than one of these economical stoves, whether it be for the parlour or kitchen; and where it once becomes domesticated, there it will be preferred over every other kind.

WATCH-MAKING.

IN what degree the duration of human life is really affected by the very perfect manner in which we now measure our time, is a question about which the most logical of moralists might differ. Common sense, however, may well deduce from practical experience the comforting assurance that, on the whole, the careful numbering of our seconds is virtually an extension of life—at least to the wise and industrious; and it is only just to regard clocks and watches as beneficent instruments for rendering human time, on the whole, far more valuable than it could have been in days when Peter Damiani, the recondite author of the work *De Perfectione Monachorum*, for want of any better means, used to measure the passage of time by repeating, in a measured tone, certain quantities of psalmody, a cumbersome species of ecclesiastical watch truly, seeing that he could only measure his time accurately so long as he chose to consume it in the operation. There can be no doubt, however, that any planet in the solar system could be well peopled by those who, like this patient clerical, have been constrained, whenever it was necessary to gauge their time, to count, or pace, or perform some other equally monotonous and thought-preventing operation; so that it is pretty safe to say that before clocks and watches came into existence, waiting was, so far as time went, generally equivalent to wasting.

The pressing necessity, indeed, which every nation, even in ancient times, felt for some efficient means, whereby the passage of the hours could be gauged, is sufficiently exempli-

fied by the nature of the various contrivances resorted to for that purpose. As early as the third century we hear of an astronomical clock, belonging to Chromatius, the Governor of Rome, the exact nature of which is unknown, as it was destroyed by some over zealous saints on account of its characters being, as a matter of course, borrowed from the heathen mythology. The illustrious Boethius, who had the honour of numbering King Alfred himself among his translators, invented a clock—a clepsydra in fact—for we are told that it measured the hours *guttis aquarum*. For some centuries, water-clocks, sundials, recitations, and other similar individual contrivances constituted the only progress of mankind towards a better system than that of dividing the day simply by light and darkness. From the East, indeed, that early nursery of mechanics, we hear of a timepiece sent by the King of Persia to Charlemagne. As each hour passed, a cymbal struck. There is good reason for believing that the original motive-force was simply water.

There is, however, some authority for thinking that the rudimentary clock, moved by a weight and connected wheels, was to be found in European monasteries about the eleventh century. Clocks, such as they were, long continued, like many other beneficent results of human ingenuity, the exclusive property of the Church. Curiously enough, in Italy itself the first approach to the popularization of clocks was made. A Prince of Carrara, named Hubert, has the honour of erecting the first public clock on a tower in Padua. This achievement, indeed, was so highly estimated that the fortunate clockmaker thought proper to change his name from Doudi to *Horologio*, while his tomb bears or bore the epitaph of almost Horatian pride:—

> Quin procul excelsæ monitus de vertice turris,
> Tempus et instabiles numero quod colligis horas,
> Inventum cognosce meum, gratissime lector.

A reference to that treasury of Old English History, Stow's *London*, shows that the care of a clock in Westminster Hall was, in the reign of Henry VI., given to no less important a personage than a Dean of St. Stephen's, with the not inconsiderable fee of 6d. per diem.

Clocks, however, multiplied but slowly, and though to their makers the watch probably suggested itself early, the origin of watches is involved in great obscurity. There is an antiquarian story of a watch dug up at Bruce Castle, in

Fifeshire, covered with horn instead of glass, and bearing the impressive legend *Robertus B. Rex Scotorum;* and it is said that Louis XI. had a watch; but we tread uncertain ground until we reach the Tudor age. Watches, however, at first, were but clocks on a somewhat portable scale; and it was not until Clement, a London clockmaker, invented the anchor escapement in 1680, that watch-making really entered that phase of scientific progress which has since reached such an astonishing pitch of mathematical accuracy. A few great names conspicuously mark the distinguishing epochs in this important industry for the next century or so. In 1724 George Graham invented the horizontal watch with the dead beat and the mercurial compensation pendulum. Then there was Harrison's gridiron pendulum, going fusee, compensation curb, and remontoir escapement; finally culminating in his celebrated longitude watch; for which, besides other rewards and honours, he received the Government grant £20,000. Progress, unhappily, does not always follow the mechanical law of falling bodies, and accelerate its pace in proportion to the distance traversed; but in clock and watch making, as an English industry, it may be said that during the last generation a progress wholly unparalleled has been attained; and it is not too much to say that that progress is epitomized in the name of Sir John Bennett, the well-known watchmaker.

In common, doubtless, with all of my readers, I have often watched with great interest that elaborate and gorgeous piece of mechanism which has practically imported for Londoners the glories of the great Strasburg clock into Cheapside; and knowing, as I did, that the repeaters of Sir John Bennett strike throughout the habitable globe, that they may be heard in the deadly stillness of the Asian steppe, in the elegant coffee-rooms of Melbourne hotels, the tent of the diamond-digger in Natal, or high up on the marble highways of the Peruvian Incas, I felt, naturally, considerable curiosity to inspect those premises which are to Cheapside what St. Paul's is to Ludgate Hill.

There are few manufactures where that subdivision of labour which excited the admiration of Adam Smith produces more astonishing results than in the making of watches. It is only, indeed, by employing individuals exclusively upon particular parts that a virtual perfection is at length attained and the watch turned out at last at a comparatively low price. My readers will not, of course, be surprised to hear

that the consumption of watches has enormously increased; but it is probable that few are prepared to be told that the number of watches manufactured in this country remains very much the same! It follows, therefore, that the manufacture has gone, to a great extent, out of the country. It is, in fact, concentrated in Switzerland. There the operations are carried on by workmen in their mountain homes, and owing to the prevalence of a decimal system in making the various parts of each watch in quantity, the Swiss has a very great advantage over the English method. The various portions of each watch are produced in numbers, and mathematically alike. When, therefore, a wheel or any other portion of any given watch becomes defective or breaks, on application to the maker of the part in question, he has but to open a drawer and extract thence whatever is required. On the contrary, the English workman would have, in such a case, to manufacture expressly the part wanted. This alone is an important distinction; there is, however, more even than this. Some years ago, it must be in the recollection of my readers, that Sir John Bennett gave a series of valuable and interesting lectures on watches and watchmakers, in which he demonstrated the causes which have resulted in driving the trade to so great an extent abroad. Of all these causes, however, the most cogent was the employment abroad of female labour. The Swiss wife and daughter are intrusted with the polishing and many other purely mechanical offices in connection with a trade which, in England, is confined to men alone. Now, in a manufacture like that of watches, it must be clear that where the productive forces of any country are nicely balanced against those of other countries, any considerable difference in such an item as that of wages must inevitably drive the trade over, in whole or part, to that side where the lowest rate prevails. The Swiss women can earn in their leisure at home as much as 15s. weekly, for doing work performed in this country by men. The result, therefore, is obvious. The Swiss husband and father, who comes down periodically from his mountain home with the collected work of his household as well as his own, returns with comparatively a large sum of wages as the value of the joint family earnings, and yet he has very greatly underbid his London brother-workman in the rate of wages. A certain portion of the Swiss earnings, therefore, represents so much English industry which has necessarily gone unemployed. Now, while the export of

commodities is always to be encouraged, the enforced export of work, *which leaves the workman competent to perform that work idle at home*, is to be most earnestly deprecated. From this we have a most prolific cause of pauperism and vice.

I know, indeed, from experience what are the evils of the employment of women in ordinary factories; but in this particular case the work is done at home; it is of an agreeable character and fairly paid for, even in its mechanical forms. Notwithstanding all this, on Sir John Bennett first attempting to introduce the Swiss family system in a modified form into the Metropolitan industry, he was met by the most determined and dangerous opposition. In the first place he had great difficulty in obtaining the necessary instruction for a few ladies in reduced circumstances, who were willing to make a trial of the new industry. In the issue, a large meeting of the operatives of the London watch trade (held of course at a public house) denounced the trifling contingent of female labourers, and fairly hunted them out of employment. The ability of these ladies may be guessed, however, from the fact that one of them, who obtained work at a glass-engraver's, won afterwards prizes for herself and employers at the South Kensington Art Schools.

But this, even, was far from all. The employment of women on the one hand against that of men on the other, is, of course, of itself quite sufficient to turn the scale against England. Unfortunately, as Sir John Bennett long ago lucidly demonstrated, the disparity also extends in a great degree to the *men* themselves. In France and Switzerland, as my readers know, *technical* and *artistic* training extends to industrial classes in a way undreamed of in this country. Every Swiss child, for instance, learns drawing. As a matter of course, where any species of artistic ability lies latent, it is sure thence to be adequately developed, whereas among ourselves, there can be no doubt whatever that a vast amount of sterling ability is lost for ever to the individual, to the nation, to mankind, simply because the only sure means for eliciting such ability from among the poor do not exist. As my readers know, Sir John Bennett long ago pointed out, in conjunction with other now accepted authorities on national education, that the most serious and increasing evil results were springing from the total absence of artistic training in

the education of the mass of English people. He had, indeed, good reason for knowing this. I will just mention one little case in point which strikingly illustrates the difference between the normal cultured and the normal uncultured workman. Sir John wished to have his name engraved in a certain batch of watches. He expressed this wish, and in due course the watches returned duly inscribed. Now had this been done by an English workman, we know very well that the work would have been executed with a Chinese exactness in making each a facsimile of the other. Not so however, with the artistically-minded industrial. Every case had a different design, and this, too, without any extra charge being made. We may imagine the price that a capable British workman would have expected for engraving a name in a dozen or more different ways. How then can we reasonably expect our methodical one-idead English industrial classes to compete successfully with a people capable of exercising individual taste upon the objects of their ordinary industry, and even taking sufficient interest in that work to impart gratuitously an elegance of designing which in England could be obtained only by paying a high price to a workman specially qualified for such artistic labour?

These seem to me most important points for the careful consideration of our School Boards. It is needless to say that the famous establishment in Cheapside contains many truly luxurious examples of clocks. A few deserve, however, to be particularized. I saw, for instance, a curious combination of the mechanical picture musical box and ordinary clock. It bears the date of 1763, and was made by Sir John Bennett's grandfather. It strikes with a silver tone and plays a variety of beautiful tunes. This is, of course, an historic relic and a sort of heirloom. What strikes one most, however, is to find that more than a century ago artistic mechanism had attained so high a degree of perfection in England. In the side window there is the well-known clock, where Greenwich time is given through the medium of an electric current with that place, and where a crowd daily collects, only inferior to that which gazes from the other side of the road on that English version of the great Strasburg clock which has revived in Cheapside something more than the ancient glories of St. Dunstan.

An admirable design for a yacht-clock merits special notice. It includes a compass, weather-glass, thermometer,

&c., and is so delicately yet strongly contrived as not to be at all affected by the motion of the vessel, the whole swinging easily, as it were, in the cradle of its stand.

There are, too, many excellent designs for the chimney-piece, and these, indeed, render the show-room at the back a by no means insignificant art exhibition. Some of the bronzes, particularly an Ajax, struck me as not unworthy to be mentioned with the work of a Benvenuto Cellini.

The general impression, indeed, resulting from my visit to this world-famed establishment, was a most pleasant one. Certainly it seems that, as an employer and developer of artistic English industry, Sir John Bennett has a foremost place in the ranks of our practical philosophers. His adaptation of the Swiss system to the existing English trade has now borne a certain amount of fruit; and it is only to be hoped that these truly philanthropic efforts will meet the full success they deserve. The technical and artistic training of the people is of primary importance, as tending directly to elevate the entire body of the nation at its lowest point to a generally higher social grade, and thus realize that permanent progress whence there can be no regress.

TENT-MAKING.

IT is curious that the oldest form of human habitation should, relatively considered, still survive in greater perfection than others. The first attempt of man towards home life was under the shelter of a tent, and even now no inconsiderable section of the human race have no shelter beyond that afforded by various descriptions of tents. Some insects build their nests downwards, and it might strike a fanciful mind that mankind, in commencing to build, began with the roof first, and only got to walls after putting up with roofs alone for generations. It is curious, too, that as the world gets older, it does not appear that tents are at all likely to become obsolete; on the contrary, the consumption of the materials employed in their construction increases, at least among civilized races; and although the nomad tribes are, no doubt, gradually disappearing, the use of tents among mankind actually increases. Next to the delightful lot of the tax-defying Tartar, whose horse furnishes at once a carriage and a bed, warmth and shelter, safety, and often food, there are few things more charming to roving and imaginative dispositions than life in a tent, and there is certainly no art which has progressed so rapidly of late as that of tent-building. In these days we may say indeed that iron and glass are the principal materials whereby the greatest architectural marvels are produced, but to glass and iron must be added canvas, and wherever these three are combined together results are achieved altogether impossible by any other means.

Some time since, I had a thorough initiation into the art and mystery of tent-making, and believe much that I saw of will be as new to most people as it certainly was to me. I first visited the premises of Messrs. John Edgington & Co., in

the City, viz., 48, Long-lane, West Smithfield, where the flags and artistic portions of their trade are produced. The value of space in the City and the requirements of their business having both increased together, the establishment of a larger factory in another district became inevitable, hence I was, for further practical information, conducted to 108, Old Kent-road, Southwark. The front of Messrs. John Edgington & Co.'s premises, with its projecting portico, is very conspicuous in the long line of business houses which give this portion of the Old Kent-road so distinctive a character. On entering, you see before you a long vista extending to the operative premises behind the warehouse, and a space generally closely packed with tents of all sorts and sizes, flags, cordage, and a ceiling, apparently supported by the pillar-like blocks of canvas built up underneath it. When one remembers that tents are here in stock over 200 feet long, and rick cloths of 300 yards, it is easy, without much imaginative arithmetic, to calculate how vast a space the contents of this wonderful store would cover with what is, superficially considered, a veritable ocean of canvas. Behind is the factory, or rather, one section; that one, where the tarpaulins are prepared, being on the other side of the main road. The working space extends to Cornberry-street behind, and affords ample room for laying down the largest masts ever employed as ridge poles or otherwise in tent-building, or in any form of outdoor festive demonstration. Those who most dread the possible effects of an absolute utilitarianism, would be much comforted by inspecting the really vast collection of flags that are to be seen here. This, indeed, is one of the most artistic departments of the manufacture, and is chiefly executed at the City factory, 48, Long-lane, West Smithfield. Neatly rolled up, something like pieces of paper in a paper-hanging warehouse, are to be found the colours of all nations, and flags, standards, and banners suitable for all possible occasions. Some of the more elaborate banners are silk, beautifully painted, and displaying, in various emblematic designs, a very high degree of cultivated taste. Those who have seen, as so many of us have often done, how rapidly London can clothe its external and prosaic aspect in the poetic splendour of bannered pomp, will no longer wonder if they only inspect this vast collection of silk and bunting; and I can well fancy how, had the sage of Chelsea passed a meditative hour among these symbolical stores, he might have given us a chapter on Flags, even sur-

passing his famous dissertation on Aprons. Here there are ensigns of all nations, standards of every political shade, banners for war or peace, all as neatly folded, labelled, and succinctly described, as the business papers of the most methodical lawyer. The packing-up in such a manner that immediate reference can be made to any particular article is, in such an establishment as this, as wonderful as it is complete. Tents of all kinds, as well as flags, are neatly arranged in recesses, lettered and numbered; and, by simply looking around the walls of these convenient stores, you can find in an instant tents or flags of any given size or belonging to any country, or of any special character.

It would, indeed, be quite impossible to get on at all without some such system, even where there is so large and superficial a space as in these factories. Miles and miles of canvas and cordage, and myriads of flags are here compressed into a comparatively small space around you, while the tent-poles and solid burnished brass spear-points are thick as weapons in a well-kept armoury.

Economy of space and of time in saving unnecessary labour have been incessant studies; the very forms which, when covered over with red cloth, look quite regal, are simply deal planks with folding feet at each end, thus enabling them to be packed as closely as boards.

The umbrella tents particularly took my fancy; these are marvels of inventive ingenuity. Opening exactly the opposite way from that of the ordinary umbrella, they combine great strength and convenience, and obviate the awkwardness of their predecessors, which used to shut down suddenly, to the sore discomfiture of all underneath. The central shaft consists of two pieces, the lower being spiked for driving into the ground, and at the junction a table-top may be inserted, thus affording an additional advantage. These tents, which can be properly set up in a minute, are now provided with oblong boxes, not much larger, if any, than croquet cases, and the whole may easily be carried by a child. The box, too, has store-room, and thus, in the case of picnics and other similar outdoor entertainments, may be converted into the receptacle for many other articles, the whole being a most economic burden in bulk and weight.

These small tents, especially those of the umbrella pattern, have a very pretty appearance; some are provided with opening made exactly like windows, only there is no glass, and a portion of the tent itself forms, when required, the

blind. So solid do they look, that I am sure, at a little distance, they would always be taken for wooden, if not for really more substantial erections than that.

It is certainly very interesting to note how completely every exigency is provided for, and how that which covers so vast a space can be brought in a few hours into quite a small compass. The floors pack up in convenient sections of four planks apiece; the long seats, that look so imposing when covered with red cloth, go into the compass of so many stout boards, or furnish portable lockers for holding the ropes, pegs, and other minutiæ of tent erecting; while small boxes, with separate compartments, receive the candle glasses; and so, in a few hours, what had been a dazzling hall within, all bright with light, and gay with flowers and floating flags, is but a collection of long narrow boxes—enchanted cases, like those we read of in fairy lore, ready to unfold their wonders of light and splendour, perhaps at the other end of the kingdom, or, it might be, even in another hemisphere.

Across the road is another section of this great factory, consisting of several floors. Here you will see a number of women working, sewing seams of interminable length. In one of these rooms a marquee was making, which, when finished, would measure 330 feet long by 50 feet wide. I saw here an admirable specimen of the gymnast's net, 50 feet long and 11 feet wide—made of very strong cord without a single knot; a man might fall from almost any height into such a net and sustain no harm. On another vast floor you see a great collection of rick-cloths, representing a tremendous quantity of cloth. The paper manufacturers are consumers of this kind of waterproof, requiring cloth of immense size to cover the esparto grass now so extensively used in paper-making.

Among the many admirable examples of ground-sheets and rick-cloths to be seen here is one made on a circular principle for round ricks, and so ingeniously contrived that just in proportion as the rick is gradually cut down, so can the tarpaulins be accommodated exactly to the reduced space to be covered in.

An enormous mass of tarpaulins is here kept in stock; and as all are arranged according to the admirable plan of sectional classification pursued throughout this great factory, any demand, whether great or small, can be supplied in a few minutes, thus exhibiting, in a very great degree, the immense advantage which there is in the possession of unlimited

capital and a perfect system of departmental detail. Here I saw some fine Norway spars and tent-poles undergoing a chemical process for the purpose of preserving them from decay, those thus fortified enduring till they happen to be broken, which, under ordinary circumstance, never happens. On another day than that of my visit to these factories I had the pleasure of seeing one of these canvas palaces erected at Clapham, for a grand fête given by a Greek merchant. Standing on a smooth well-kept lawn, with a background of foliage, the effect of these tents was very striking. A number of covered ways led into the principal one—that intended for the ball-room, and once inside it was difficult to believe that you were not in the house itself so far as the solidity of the whole went. A capital floor had been laid down, and when I add that in one large tent a billiard-table of the largest size had been accurately adjusted by means of the usual spirit level, it is easy to see that the inequalities of the lawn had been overcome. The fact that in the principal tents there were no centre poles, alone heightened the illusion greatly, while the double wing and the interior baronial-hall-like decoration, heraldic shields and handsome mirrors at each end, created an effect that one would never have expected from canvas. These tents were beautifully lighted by circular pendant hoops, provided with candles inclosed in bell glasses, so that by no possibility could any wax be spilled. The soft but strong light, falling on the bannerets and blazoned walls, and reflected back from so many brilliant dresses, would be in its effects far beyond anything that can be achieved by means of gas, even when aided by crystal. It the tent devoted for dancing, it is needless to say that the entire absence of centre poles was a source of universal satisfaction. What is most surprising, perhaps, to the ordinary observer, accustomed to other tents than these, is to see how exactly level are the ridge poles, even in cases where a length of 100 feet has been achieved; while the upright walls are compact and solid-looking, suggesting at the best that the canvas has been well stretched over timber. I never saw before, indeed, so much "wall," to the same amount of "roof." Originally tents were all roof, and the gradual improvement in the art of their erecting has been chiefly aimed at attaining a greater proportion of wall; and here, in the tents of Messrs. John Edgington & Co., I believe a nearer approach has been achieved to the form of solid architecture than has yet been approached by any one else.

The great advantage of Messrs. John Edgington & Co.'s method of fixing tents may be seen from the fact, whereas it has taken six men thirty-six hours to drive the necessary stumps for a large marquee, one ninety feet long has been entirely erected by Messrs. John Edgington & Co.'s men in two hours. While on the subject of feats of this kind, I may mention, as an example of what this enterprising firm can accomplish on certain occasions, that they once manufactured two thousand tents, each accommodating fourteen persons in twenty-seven days.

This occupation, as far as the men are concerned, is a strange, but on many accounts a very agreeable one. The majority of the men are sailors; such are indeed the very best hands that could be had for such labour. In many respects a tent must be regarded as a description of sail, the rigging requiring almost the same care in erecting as that of a ship—in both cases there is the same great force to contend with, that of the wind, and the skill acquired on salt water is exceedingly valuable on dry land in the use of erecting tents so as to resist any stress of weather.

As a matter of course the work of tent-rigging is rather slack during the winter in this climate, and during that season the men employed on tent work go to sea, or serve their allotted time in the naval reserve. The tents of John Edgington & Co. are as widespread as the British flag. At the time of my visit they were making a marquee with seats for 1,000 persons, to witness the foundation laying of the City Temple, now a thing of the past. There was a marquee for Mr. Spurgeon, at Maidenhead, with accommodation for 4,000 people; a marquee for a Royal reception at Tottenham, and another for a grand fête at Llandinam. Then there was a set of tents for a missionary society, and a grand military encampment for a German prince. This last, of which I saw some portion at the works, consisted of his own living tent, luxuriously fitted with very handsome portable furniture; a tent for the aides-de-camp, one for the steward, another for the body servants, and a grand dining tent to cover his guests, and all of these were to be fitted with everything necessary.

Hung around the offices at Smithfield were letters from those high in position, testifying the appreciation of this firm's work by Royalty, nobility and commoners.

No makers have been so successful in combining strength with convenience and beauty in the way of tent-making. At

the Marquis of Ripon's great fête a very heavy snowstorm—which would, one might have supposed, have overwhelmed a canvas building—did not in any respect interfere with a single detail of the splendid programme of amusements under canvas. The dancers enjoyed themselves under a roof of deep snow, all unconscious of its presence; and no one witnessing the brilliant scene in the canvas drawing-room would have imagined, from aught he saw, that he was moving in any building less solid than one of brick at least. Wind, snow, and rain were alike defied; and though before now tents have come to grief, and falling ridge-poles have dealt wounds and even death among a festive throng, such a catastrophe is absolutely unknown in all the long and crowded annals of John Edgington & Co.'s experience in placing—and I speak deliberately—millions of persons under canvas.

A bare enumeration of all the articles intended for tent or out-door life manufactured and supplied by this enterprising firm would occupy a considerable space. There are horticultural, cricket, garden, artists', ball-room, and every kind of military tent, from that suited for the monotonous flat of Aldershot to those expressly manufactured for an African desert or an Indian jungle.

Emigrants' tents, again, are a special feature; and the importance of these being good and strong, cannot well be overrated. In New Zealand there have been for some considerable time large numbers of the white population living under canvas, and the legend of John Edgington & Co. has become fully as familiar to the Maori as that of Bass & Co. is to the Bengal Sepoy.

There must be some substantial and practical cause for this fact, and it is to be found in the sound work, material, and skill which the experience of more than one generation has enabled this firm to bring to bear upon their various manufactures.

Every kind of waterproof clothing for winter is here to be found; while ropes, netting, asphalte roofing felt, sun-blinds, and almost every article manufactured out of canvas, form but items in a stock which, could it be called together at a given time, would indeed appear colossal. Happily for the convenience of their business, this cannot well occur; and it is by no means too much to say that—and I speak in the most literal sense—the sun never sets on the tents of John Edgington & Co.

A PIANOFORTE FACTORY.

IF—and probably there are none who will dispute the proposition—the home is the true unit evolving the nation, it follows that in the arts of private, far more than those of public life, the most enduring types of national improvement are to be looked for. Public institutions, Acts of Parliament, and all the pomp and circumstance of out-door life, do not, in many cases, effect anything like the same changes that a new article of food, a fresh piece of furniture even, or any similar item in the individual economy of home life is sure to produce. The real difference is, simply, that in one instance there is no chronicle of the influences, and in the other there is. We are sure to be told by ten-thousand newspaper-power of all the advantages resulting from a new fountain, or a fine arcade, or a Gothic town-hall, but we hear nothing of the popular new toy which may warp the disposition of thousands of children this way or that, or the new article of food which may—laugh as some will at the supposition—compress or relax the brain-fibre of those who eat it, and so have in itself an influence to which that of the Legislature even may be altogether insignificant.

Be this as it may, I have always considered that the systematic improvement and reform of our home life, more especially among the lower strata of the well-to-do classes, was of the first importance to the future health and continued energy of the national career. English home life has, beyond question, hitherto had one capital defect. It is too exclusively solid; the pillars on which it rests are uncarved, so to speak: there is too generally a tendency to practise the severest utilitarianism; and it is only of late that the nation has very

generally seen the wisdom for exercising a selective discretion, and borrowing from the Continent all that is most desirable and unobjectionable among the graces of private life.

From this view-point indeed, the continued culture of music, in its absolutely domestic application, is, I think, a most hopeful symptom, and in this—the purest form of artistic pleasure—there is surely an abundance of good wholly without alloy.

Feeling thus, it was naturally to me very agreeable to find an opportunity for closely inspecting Messrs. Strohmenger & Sons' pianoforte factory, 169, Goswell-road, E.C., London, where pianos are made from beginning to end, and that at a rate which in many cases places those directly purchasing of the manufacturer in the possession of instruments capable of lasting a lifetime, and yielding all the while everything that can be desired to import the best music of the concert into the private home.

The factory in question is unpretending enough, viewed from the outside. I first entered a very long room with a perspective of carpenters' benches below, and for several feet between your head and the ceiling methodically-ordered stacks of seasoned timber; this, in fact, is quite an exhibition of woods, some rare, many beautiful, and all costly. It is a study in geography. There is beautifully grained sycamore, and choice lime-tree wood from England. North America contributes its iron-like birch, its substantial oak, and fine-grained pine. From the Southern continent comes cedar. So much for the interior. Cuba contributes mahogany; Brazil, rosewood; Italy, walnut; and Ceylon, ebony for the cases. This by no means exhausts the department of necessary stores for the production from beginning to end of even the smallest piano. Brass, copper, iron, steel, and zinc, in metals; green baize, box cloth, and felts, in woollen fabrics; buffalo, calf, doe-skin, and fawn, in leathers; besides a miscellaneous assortment of ivory, glue, French chalk, glass papers, polishes, and even black lead, are all to be found here. A piano, as everybody knows, is, although in construction the most elaborate, in principle the simplest of musical instruments. Its strings, which are put in motion by striking the keys, extend over harmoniously constructed bridges, rising on to the sounding-board, the necessary vibration arising from the action of the hammers

which connect the keys with the strings themselves. As with most other things, the foundation is all important.

By the foundation is meant the back of the piano. When one reflects on the constant action of an ordinary piano—for in some cases a lifetime—and remembers that in nature there is no force more irresistible than a harmonic vibration, of course, relatively considered, it is easy to perceive that in such an instrument absolute solidity is essential to the three necessary conditions of a really good piano—sweetness, power and durability. The first thing you see is the back. It looks like a bit of barricade for an elephant's stable. Nine vertical beams are set in two transverse ones, eight being, as I was told, the ordinary complement. Immense strength is here the one object in view. On the Continent, I hear, iron is greatly employed—compared to wood a most defective sound-conductor. These great timber braces, fit to bear one of our naval armour plates, are carefully seasoned, and secured with powerful nuts and exquisite glueing, bringing corresponding parts together with the precision of atmospheric pressure. Such strength is indeed needed. Every pianist may not remember that on striking the key there is a pull at once on the frame of over 50 lb., while the seven octaves can develop a strain of five tons. These interior timbers are far beyond anything I have seen in the carcases of the conventional suburban villas of the present day. Cramps of very great power are used in forcing the timbers into their places. In this great joiners' shop you will see in one place the frames being put together, in another the introduction of the sounding-board, here the process of stringing, there the screwing up of the steel pegs which tighten the chords, and somewhere else a man industriously fashioning the key-board itself. The hammers are very carefully made; each piece of wood is cut with mathematical precision, while the necessary covering in felt or leather has to be glued on with perfect nicety. All the woods employed in the construction must not only be, where really good instruments are designed, of excellent quality, but thoroughly seasoned.

The shrinking or expansion of any part, independently of the calculated and harmonious vibration of the whole, is immediately fatal to the excellence of the piano. Not only must the wires be of the best, the sounding-board perfect, the lining thorough, and the performer proficient, for the expression of good music, but the entire and, as I have

already shown, heterogeneous collection of materials composing the whole, must be themselves in the same subordinated concord with respect to each other as that of the written music itself. It is very pleasant work; there are chips, shavings, and sawdust certainly, but these are of the cleanest.

It is hard to imagine manual labour of a more agreeable and intelligent cast. The atmosphere is, however, of the driest, and if there is any cause for complaint on the part of the workers, it must be that the place has perhaps just a trifle too much of the oven about it. Of course this is unavoidable; every particle of moisture must be eliminated from the woods in the stacks above before they are fit for use. All the work is careful, but that of the sounding-board is, perhaps the most so. When this, one might say sympathetic soul of the instrument itself is shaped, and in fact finished, it is rigorously tested in every possible way. The workman will play upon it as on a drum, and he has in fact the first musical promise of the new instrument.

As to the cases, they too are made on the premises. There are collections of legs for instance, fresh turned and only waiting to be polished, and, as one might say, quires of ornamental fronts in a variety of tasteful designs. These indeed represent patient, careful, and highly artistic work. The plan of placing open wood-work over silk has naturally led to a great elaboration in this department of designing. The floral scrolls and geometrical devices are slowly cut out with a fine saw, and one slip at the last moment may spoil the work of a week or more. The only thing, I believe, that Messrs. Strohmenger & Sons import, so to speak, into their factory are candle-holders. As might be expected where the whole instrument is put together by one body of workmen under one superintendence, many improvements in detail, as well as in principle, are discovered from time to time and introduced. Messrs. Strohmenger & Sons have invented a check-action, which has many advantages to commend it. For instance, any single note can be withdrawn and repaired, or otherwise dealt with, independently of the rest. As is usual, wherever the whole of an industry is concentrated under one roof, it is curious to see how one set of workmen feed another with work. From the cramping of the backs to the veneering and final polishing of the cases, there is one motion through all the intermediate and connecting stages, and a fanciful Positivist might possibly tell

us that these workmen were playing a capital piece of industrial music with the various metals, woods, leathers, and fabrics, which when adjusted in certain concordant relations, evolve the piano itself. Even in these days of successful strikes and prosperous times, for all but professional and middle-class workers on fixed incomes, a pianoforte manufactory is, I should judge, somewhat of a haven for even the most exacting artisan. The earnings, in fact of the men, range from seventy or eighty pounds a year to double that amount; many earn a hundred and fifty, and as the labour is carried on in a well-ventilated workshop where the air is invariably very dry and warm, and as none of the operations are hurried—hurry being incompatible with the patient care which is here indispensable with every detail—the industrial seems, as Conservative grumblers might tell us in these days, to want nothing here to complete his happiness but a good grievance. A great many of the instruments here made are of a price placing them even within the means of the masses. So far as I could see, the essential parts of the cheaper are fully as good as those of the dearer kinds. Greater compass, intenser power, and superior beauty externally constitute the difference.

I have shown how pianos are built; I have now to speak of the show-rooms, 206, Goswell-road, and the system whereby they are disposed of to the public.

Goswell-road is, as all my readers know, one of the most work-a-day of London thoroughfares, and hardly the place where one would look for a musical gallery; and probably few persons passing by think of the concentration of future concerts—domestic and public—within the dull brick walls, which share in the general dinginess of the not, architecturally speaking, very ornamental road. The upper, as well as the ground floors, are converted, I may say, into musical cabinets, where it is surprising to me that people do not generally spend much more time than they actually do. There is something exceedingly suggestive in the sight of so many instruments, all mute and awaiting each its special destiny. Every piano that one here sees has its history to come; and while the music of a stray performer, here and there, steals over one, it is difficult to refrain from a reverie on all the varied phases of human life that each piano is some day to be identified with.

You see them here in all woods—mahogany, walnut, ebony, and gold; and it is a curious speculation to a

materialistic mind, as to how far the question of what wood and what form a particular piano may be encased in, may influence the lives of those into whose hands it may pass. Despised and ridiculed as such speculation may be by many, we have but to refer to the trumpet-note that swells the blood to fever-heat, or to the soft, fresh field of rain-washed grass, that gives such repose to the eyes of the weary-minded, to ascertain how potent is the spell of form and colour on human nature even; and to perceive how vast a field for investigating human motives is left unturned by those who would laugh and scorn the notion that whether they slept in a red or green-papered room the result would be the same to them. However, to my mind, the pleasantest speculation is that which most naturally suggests itself when one finds oneself environed by so many pianos. Each instrument may be the sweet nucleus of a home-life to come, and one thinks involuntarily of

Fairy hands that flitting, pass
  Across the ivory keys,
As sweetly as o'er meadow grass
  The summer-scented breeze;
Of tender hearts and gentle eyes
  That light up home within,
And teach us here the holy guise
  Of worlds that know not sin;
Of thoughts too sweet for any tongue
  But music's to express,
Of joys that make the aged young;—
  Give wrinkles loveliness;
Melodious moments glad and bright,
  Dear both to soul and sense;
For music can by magic might
  Humanity condense
Into the diapason grand
  That in itself explains
Why faith in God in every land
  Is bound in music's chains!

But, to come into the every-day region of practical life, I cannot but think that a factory like Messrs. Strohmenger & Sons exercises no unimportant influence on social life. Here, as I have shown, pianos are manufactured of a size and price that bring them immediately within the means of persons unable to purchase of the more expensive makers, and yet unwilling to put up with those inferior instruments which are turned out—unseasoned in their frames and imperfect in their construction—to meet the demand for a cheap article.

Here, as may be anticipated, the system of buying pianos by instalments, and having the use of the instrument during the period, prevails, and the plan is in itself an admirable one. Many persons thus become possessed of something like property who otherwise would never have more than a trifle beyond their current requirements, and the habit of saving in so tangible and agreeable a manner must *per se* be of great moral utility. The sending out of defective and often worthless instruments thus has doubtless prejudiced some persons against a system in itself so good, but it only needs to be widely known that really sound and durable instruments can be obtained thus to aid in a dissemination of pianos among the houses of the people, as well as of the middle classes, that will bring about the happy consummation of making three articles the indispensable condition of every home worthy of the name—a sewing machine, a clock, and a piano. Just as a well-known firm has of late years, by the strictest adherence to its professed principles of dealing with the public in the supply of sewing machines, won almost the absolute confidence of those who deal with it, so are Messrs. Strohmenger & Sons popularizing a piano at once good, lasting, and, though very cheap, obtainable on terms made still easier by the adoption of a system enabling nearly everybody possessing a home at all, to obtain through a series of insensible efforts an instrument which would do credit to any room in the land, not only for its execution, but for its appearance also.

Certainly these musical savings' banks are attractive things. There is security as absolute as that given by the Post Office Savings Bank, and rather better interest, as those who try the former find to their satisfaction. During the whole period the purchaser has the full enjoyment of the property he is insensibly acquiring; and the fact that such a system can exist is surely one of the "common things" of our everyday civilized life that, when at all examined, expands into something like a wonder. It is, indeed, a great fact, that, by means of combination and the original possession of capital on the part of the producers, anyone among us should be able to enjoy, from the first moment of commencing the payment of but a few shillings weekly, the full possession of a most wonderfully elaborated instrument, built of costly woods that have been seasoned for years, and put together by the labour of many men better paid than the average of our curates.

A FURNITURE EMPORIUM.

I HAVE often wondered why Carlyle never found it worth his while to give us the Philosophy of Furniture, about which fully as much, or more, could be said as on clothes. The most silent, persistent, and gradual are also the most powerful influences, morally considered; and I cannot doubt that the colour and form with which we domestically surround ourselves in our homes have very special effects upon our character and even temperament. At any rate, without going so far as to assert that the more practical among our Lares—*id est*, the household furniture—can be primary moral influences, it is by no means so difficult to understand how they act as secondary causes in developing the disposition. Be this as it may, I think that few persons could visit, as I have done, the showrooms and workshops of Messrs. Maple & Co. without, at least, a feeling, if not a thought, that furniture, after all, must exercise a very important influence upon the character, and that it is even possible so to order the interior of our abodes, supposing only the necessary means and the necessary taste are at command, as to produce a very satisfactory moral effect upon those inhabiting them.

The progress made in furniture and upholstery generally, in its various branches, seems to me, when compared with what I have seen of mediæval times, to be very great indeed, perhaps greater than the advance in any other equally important industry.

Externally, perhaps, the frontage of Messrs. Maple & Co.'s establishment does not differ much from

that of many other firms with which, however, there can be no other comparison, although that frontage, according to its numbering, includes some five-and-twenty houses. But, when you pass the threshold you at once find yourself in a kind of vast exhibition extending in all directions, closely but artistically packed with every description of furniture, comprising the wealth of the forest and the mine, and really concentrating into a *coup d'œil* the most costly products of the tropics as well as those of our own latitude. You do not see here that bustle which prevails in many similar establishments; there is, indeed, a bank-like appearance in the well-ordered counters, and, although something like a hundred salesmen are engaged, you do not see that crowd and hurry which renders the interior of so many draper-upholsterers more animated than agreeable. Along one of the principal avenues are a number of recesses, something like the inner apartments seen in models of ancient Roman houses. These have windows provided with rose-tinted curtains, and the furniture—elegant couches, luxurious ottomans, and other articles designed for the drawing-room or the boudoir—are here disposed in the most effective manner; while the subdued and poetical light gives the whole the exquisite finish of some of those cabinet pictures which mark the happiest moods of a Greuze or a Rottenhammer. Here, indeed, a lady may choose her drawing-room suite without apprehension that the effect in her own house will be quite different from that which she anticipates.

Ascending to the successive floors of this vast building, which constitutes a series of splendid show-rooms, you find at the top of all an immense expanse of easy chairs of every imaginable variety, in shape, colour, and material. It is a very paradise for lazy people, luxuriously minded, and possessing good eyes for colour. I hardly think that any one but the most positive utilitarian could succeed in traversing these very agreeable avenues at anything beyond a saunter. Below, you have a great array of bed-room furniture. Here I saw several designs which, in execution as well as material, struck me as combining the best taste with the most successful execution. In a wood, for example, so simple as ordinary pine, we have here toilet tables wrought out into a beauty of detail which reminds one of the very finest mosaic work, and shows how high a value artistic workmanship can put on even the cheapest material. There are bedsteads in the mediæval style with

massive ends carved out in a kind of Gothic architectural design; these are solid and strong, and contrast well with the exquisitely-finished iron and brass bedsteads which form, in another place, a fine vista for those who sympathize, as, indeed, who does not, with the not unwelcome mood of mind which prompted the fine exordium:—

"Tired nature's sweet restorer, balmy sleep."

But to return, many of these finely-finished toilet-tables and washstands are further beautified by inlaid pieces of china. In some instances the designs are floral: I particularly admired one in which each compartment represents a bouquet of different flowers. In perfect harmony with these original and striking patterns is the new description of water-jug, soap-dish, &c. Here, instead of the ordinary handle, we have, in the case of the jug, one on each side, in the form, however, of a ribbon carelessly cast into its proper place, and happening by great good-fortune to stick there and become instantly petrified into its correct shape and position. It is impossible to describe adequately in words how pretty and fresh the devices look; they must be seen to be appreciated. The same pattern, which I understand is called the Beaufort, is to be found in the form of a twisted rope. I do not think that any person, seeing the old-fashioned handles side by side with the new and in its freshness of floral design, would hesitate a moment in choosing the new pattern.

Among the toilet-tables are many which deserve, I think, very special attention. Those in black and gold form a kind of cabinet, and, having drawers like a secrétaire, are pieces of furniture fit for any palace, while the oval mirrors are worthy to reflect back the fair faces that sooner or later will doubtless make anxious inquiries into their pure and faithful depths.

But these are only the products. In a separate building behind are a series of work-rooms, the most airy, the best lighted, and altogether the pleasantest I have inspected. Here you see long rows of well-dressed and, generally, to do them but scant justice, well-looking women and girls busy at work making up chintzes, cutting out and sewing, and performing a variety of offices connected with the drapery of those palatial establishments as well as

that of the more modest households which Messrs. Maple & Co. supply.

Everything here is done necessarily on a departmental system. Indeed, the whole establishment is in its way a little Government. There is a carpet-planning room, and there are rooms where industrious women are engaged from morning till evening making up carpets of all sizes and patterns; while, again, the packing department swarmed with strong active men, each toiling, as it seemed to me, with desperate but vain energy in the hopeless task of lessening, by dint of their numbers and a fair contingent of waggons and horses, the enormous stock to which so many industrious and clever hands are continually adding. Below the shop floors are the extensive warehouses. Here by the dim light of countless lamps carefully guarded by wire frames, you may wander for hours among immense rolls of carpets supporting, as it would seem, the ceiling, and resembling, to my fancy, the dwarf, squat pillars seen in early Egyptian architecture. Enormous bales of blankets correspond with the interminable rows of bedsteads above; while the recurrence of storage department after department, each filled to overflowing with the staple fabrics required for the household, had a bewildering effect on me, who came merely to see a rather large shop, and not an exhibition of British furniture in its raw as well as its finished state.

In curtains alone there is quite an artistic study. Satin and silk are here in their richest profusion, and some amber satin of great width and beauty, designed for a coming ball, certainly looked beautiful enough to canopy czar or sultan.

Among the chintzes there are, as might be expected, some very lovely designs. In a department devoted to them alone, the rolls are deposited in such a manner that a very striking effect is produced, enabling you to glance at the wall against which they stand and perceive at once the various colours in stock and the full effect of each; while the disposition is artistic and produces a perfect harmony of hues throughout.

Great as is the actual industry here, it is little indeed when compared with that which is merely represented. A clever and admirable system of farming out the work is here pursued. The cabinet-making, for example, is given out to individual mechanics. They are provided with

the necessary materials by Messrs. Maple & Co.; and thus good work in detail is encouraged, while the evils resulting from strikes, so often commenced by idle artisans, is obviated, not only to the advantage of the employer, but also to that of the employé too. Were the work concentrated in one or two establishments, it would not only involve the necessity of erecting an enormous factory, but also various disadvantages resulting from the facility with which a certain class of workmen now take advantage of sudden pressure on their employers in order to exact more than the public can afford to pay—for after all, it is the public who are the real employers affected by a strike.

Throughout the entire establishment the most exact system prevails. An organization, as I have said above, like that of a little Government, has been introduced, and the whole business proceeds with the regularity of clock-work.

On investigating more closely the operations of the firm I found how great is the benefit to the buyer resulting from the possession and the judicious employment of vast capital. Taking the case of carpets alone, I found that the setting up of a pattern occupies about a day, during which the weaver remains idle. One piece is done in a day, and then, should no larger quantity be wanted, it follows that the preliminary arrangements must be gone through again. Now a firm like that of Messrs. Maple & Co. can take a number of pieces, thus making it worth the while of the manufacturer to allow them a large reduction in cost, and thus render it easy for the firm itself to confer a portion of the benefit on the purchasing public. As a proof of this I may mention that one pattern has been worked for Messrs. Maple & Co. during a period of five years! Indeed, there are cases in which the manufacturers would rather buy back from them the surplus pieces of a particular carpet than incur the cost of setting up the pattern again.

As a matter of course, a firm able to do this can go into the market with an immense advantage over those buyers who have but a limited command of capital. The great houses, in effect, control the market, so far as prices are concerned, and, buying to great advantage, can and do participate in the gain with the public.

As to the employés of the firm, they—taking into account those who farm out the cabinet work, &c.—are legionary;

and as, consequent on the excellent system here pursued, industry and skill receive a *pro rata* reward, the influence of Messrs. Maple & Co. is proportionably beneficial through the large section of our operative world with which they have immediately or remotely to deal.

But, in addition to this merely commercial aspect of the question, there is, to my mind, another and very great advantage resulting from the operations of such a firm dealing in so large a way with manufactures and turning out annually such immense quantities of highly finished articles; there is not only the opportunity but the direct encouragement to cultivate art as the readiest means for foiling competition. Even a firm like that of Maple & Co. might be matched by capital, so far as material goes; but where an actual advance has been made in artistic excellence it is not so easy; and the power of obtaining at once the best material, together with the best intellect to bear upon that material, may be regarded justly, in its constant exercise on a scale like this, as of national importance. Such great houses can scarcely continue their operations long without doing good far beyond that of merely supplying certain domestic wants: the beauty and taste that issue from these designing rooms is spread broadcast over the land; and if, according to my own notion, form and colour are the great fact-teachers at all periods of life, I am well assured that such an establishment as this has something to do with the material progress of the nation in all its varied phases.

WEAVING WIRE AND GALVANIZING IRON.

IT may not be, I think, so very wide of the mark to say that civilization now finds its principal muscles in metals. Unquestionably metallurgy, in its ever-extending application to the useful arts of life, whether in its public or its merely domestic aspects, has made of late great advances. It must be borne in mind too that in many cases in constructive processes, timber cannot possibly be employed, while there are in general many obvious advantages, such as simplicity of construction, economy, strength, and duration of material, together with elegance in form—where that is an object—which can alone be obtained from the judicious substitution of metal for wood in a vast variety of cases. To what extent the use of metals interpenetrates the ordinary machinery of our daily lives, all of us know well enough, but comparatively few, perhaps, are aware of the "plant" required to turn out a wire net or a sheet of perforated zinc; what I saw, therefore, at the three principal factories of Messrs. Braby & Co., during a visit, may prove interesting to some. At Fitzroy Works, Euston-road, the salient features are wire-weaving and zinc-perforating. The machines employed for the latter process resemble somewhat the largest printing-presses. Between two upright beams of polished steel there rises and falls by steam-power a kind of guillotine arrangement, the bottom of which consist of a long bar forming a series of matrices wherein are set a number of steel punches; it is by these that the zinc is perforated into the desired patterns. Beneath this set of matrices is a corresponding series, so that the punches on descending fit

exactly into them, after penetrating whatever is placed beneath. By placing, therefore, a well lubricated sheet of zinc on the bed behind these parallel matrices, and slowly pushing it forward while the set of fixed punches rise and fall, the travelling sheet receives a series of perforations across, and row added to row, as the sheet advances; any pattern can be punched out according to the character of the dies employed. Great care has to be exercised in getting a perfect correspondence between the upper and lower matrices, as it is necessary that after penetrating the zinc the punches should enter into the orifices below, whereby the truth of the perforations is assured. The dies are set in their places like printers' type, and the whole arrangement of this admirable machine closely resembles automatic printing. The sheets of zinc, indeed, are "fed" into the presses as nearly as possible as paper might be, only instead of going round a cylinder over, they pass along a level table under the descending type. Messrs. Braby & Co. have twenty or so of these beautiful machines at work, and can execute any pattern by means of new matrices; stars, flowers, geometrical devices and arabesques can all be produced by a new combination of dies, and after once travelling under them the perforated zinc needs only to be smoothed on the lower side to remove the slight projections arising from the passage of the dies into the matrices below them. In the engineers' shop here—a vast building full of metallic life—are the usual appliances for metal-workers, such as cutting shears, which deal with zinc, tin, or even iron, as scissors with muslin, and parallel iron-rollers, worked by a large lever handle, whereby flat sheets of metal are rolled round for making chimneys, &c. Filter bottoms of perforated tin are struck out at a single blow by a small press worked by hand, while cisterns, baths, cattle-troughs, buckets, and cans are seen around in various stages of manufacture. In the basement, and thus in immediate connection with the powerful steam engine supplying the motive to the machinery throughout the factory, can be seen in operation a simple but beautiful piece of mechanism, whereby pipes can be drawn, or gutters folded, as readily, but much more precisely, than most people could roll up paper or wrap up a parcel. A long and exceedingly strong iron cable works over—while placed at the extremity of an extended narrow path in such a manner that the motion once imparted is practically endless—the cable travelling round and round. At one end of this virtually

endless cable there is a kind of box, through which it passes, and in this box is a place for fitting dies. The end of a long strip of zinc, for instance, is folded by the hand of the workman into the required pattern of pipe or gutter, passed through the die, and attached by means of a hook, to the endless chain, which, being once set in motion, draws whatever it is fastened to through the dies. By this simple contrivance any length of pipe, &c., can be made in one piece, and that with perfect precision. A scarcely less interesting department of this factory is that devoted to wire-weaving. A vast room is filled with a number of machines consisting of large cylinders, working between uprights, and having in front of them a kind of narrow table in two pieces, which, moving backwards and forwards, by a curious mechanism, allow now one set of wires and now another set to be caught up and twisted by a series of hooks and blunt spikes with which the cylinder is set and which come into different juxtapositions with the ascending wires as the cylinder itself is revolving; behind, a number of great iron reels are fixed in the floor, each containing its coil of wire, and this is carried through tubes to the cylinders. A man turns a handle, and gives, by the play of the iron table through which the wires pass before the cylinder catches them with its hooks and teeth, the particular bias required to form the pattern to be woven. Any device can thus be wrought, while the process far surpasses in its exactitude and strength any other in existence. These are the principal operations going on in the Euston Factory. At Ida Wharf, Deptford, the two most interesting processes are those for galvanizing and corrugating iron. Regarding the former, you first see the "black sheets," *i.e.* iron in its normal condition as it leaves the mill—while in this state no coating will adhere to its surface. These sheets have to be "pickled," which results in the surface being wholly freed from all loose particles, leaving nothing but the hard iron itself. After this the sheets are dried in an intensely hot oven, and then become fit for the galvanizing baths. The galvanizing tanks are in two sections, communicating at the bottom, and holding, perhaps, 30 tons of molten zinc; the sheets being immersed at one side are brought up the other. They are plunged edgewise into the composition, sinking underneath gradually; a single ripple marking the places where the molten mass is divided. By a skilful manipulation of long-handled hooks, the dippers give the sheets such a

direction that they are passed under and upward, so that on emerging thence every particle of superfluous metal had disappeared from the surface. When it is desired to "spangle" the sheets the composition in the galvanizing backs is somewhat modified. I saw here many sheets, marked with the well known "Castle Brand," which is such a favourite in the colonies, and certainly the lustre and beauty of these sheets well merit the reputation that the brand has won. The machinery for the corrugating process is very ingenious. Two cylinders having corresponding indentations, regulated according to the measure of the corrugations to be produced, revolve against each other, and the sheet of metal being passed between them, comes out perfectly corrugated. No form that can be given to iron affords such facility for a perfectly watertight roofing as these undulating laps of corrugated, while the economy of their packing for export on a large scale is equal to that of paper itself. The next sight is that of tank-making. All along a shop, about 500 feet long, and shortly to be increased to 684 feet, are to be seen a number of powerful and ingenious machines employed in this manufacture. There is a fine punching machine for making rivet holes, furnished with a travelling table, whereon the plates to be punched can be screwed in any position. The edges of the plates are folded into rims by inclosure between two iron beams, leaving the required edge protruding, so that by a few blows from heavy hammers the rim is made; there are rolling machines for bending the sections of cylindrical vessels, and also for flattening plates, while the asperities of edge and surface are wholly eliminated by a trimming machine. Here, too, are the forges, and few sights are more striking, perhaps, than the rapid dexterity wherewith a large iron tank is riveted. As one workman inside inserts the rivet at white heat, another presses it firmly in its place by means of a sort of massive mace, and outside a heavy hammer is plied ceaselessly as the intensely luminous eyes of fire burst through the dark edges of the tank. An idea of the enormous consumption of these galvanized tanks is given by the solid blocks of sheets for sides and bottoms which, to the weight of about eight tons each, form in the Store Department convenient avenues. Ships' tanks abound, and here is seen almost every variety of vessel that is ever made of iron, or galvanized. At Victoria Wharf I saw the process of iron house-building and girder making. The offices here of the company are comfortably located in one of

their own iron erections, while I saw also a hospital and travelling shepherd's hut. By the introduction of perforated zinc along the ridge pole, and some other contrivances, Messrs. F. Braby & Co. have secured a perfect system of ventilation, while the plan of placing a non-conducting substance—thick felt—between the exterior walls of iron and the interior matchboard lining, insures warmth in winter and coolness in summer. Here you see the setting-out platform, while a large open air space is devoted to the test erection of iron houses, &c., everything manufactured here being crucially tried before leaving the premises. One of the remarkable sights here is the series of 35 forges, while there are besides two steam hammers, one delivering a blow of seven tons, if worked to its full extent, and the other a stroke of some two tons. The former stands on a foundation embracing an area of 50 square feet and of a depth of 40 feet. In this department is to be noted the joiners' shop, where there are several ingenious machines for cutting mouldings and planing, together with a wonderful narrow steel saw, working in an endless band over two wheels, driven by steam, and passing through a cleft in a table whereon whatever is to be cut can be fixed as required; another very powerful circular steam saw divides a whole timber balk with a speed and quiet calculated to astonish those unused to such perfect machinery as that which everywhere abounds in the factories of Messrs. Braby & Co. A lively idea of the magnitude of the company's supply of zinc may be obtained too, on this Wharf, by entering a store-room 200 feet long by 40 feet wide, where the eyes rest on a perfect sea of rather spindle-shaped casks packed tightly, each containing rolls of zinc. For colonists these roofings and iron-houses must be simply invaluable; the latter are fitted with all that can be wanted, from stoves to wheels if required, and can be made of any size, and thence in many cases of bush life and squatting become simply invaluable.

CHARCOAL AS AN ANTISEPTIC.

IT has often struck me as strange, that while from a very early period people have taken the most systematic pains to preserve their bodies after death, the great majority of them do little or nothing to insure the preservation of those bodies during life in such a manner as may agreeably prolong life to its natural limits. To embalm, so to speak, the living is certainly a much more useful work than simply to embalm the dead, and one would suppose that whatever means were obtainable for this purpose could never long be neglected.

I think it is pretty plain that it is only on elemental analysis that we can hope to reach effectually structural and organic points in the human economy so as to materially influence the ordinary course of the vital sequence from birth to death. The careful inquiries of Professor Huxley, Mr. Darwin, Herbert Spencer, and others, have certainly had this good result—they have directed attention to the importance of a fundamental physiology as being necessarily the only sound basis for hygienic agencies; and it is, in fact, in the accurate knowledge of our most elemental constituents that it becomes even possible to attain to truths that may in some cases prove practical elixirs of life.

It is well known now that four substances—oxygen, nitrogen, hydrogen, and carbon—form the essential basis of all organic life. If any one of these be absent, it is impossible to evolve from the remainder anything resembling human or animal life. It is also generally known that carbon is an equally essential constituent in the economy of the

vegetable kingdom; and this, indeed, to such an extent that without carbon, vegetation would shortly cease, and its renewal become physically impossible. Carbon, indeed, is the peculiar substance that gives to all the rest continued life; and it enters most intimately into the human constitution, being in fact that only principle within our living tissues which effectually resists their too prevailing tendency to a rapid disintegration.

For an individual to reproduce any of the other three vital constituents noticed above, in order to repair the waste of the tissues, or infuse new energy into an enervated frame, is quite impracticable, but it is very different with the fourth constituent—carbon. That substance it is possible to supply, and so to regulate the supply as to insure the very happiest consequences thence.

Now, in the first place, there is no antiseptic known which can, taken altogether, be compared with charcoal in its pure state. The great importance of taking into the animal economy fresh supplies of such a substance, which, while in itself an elemental principle of vitality, can also exercise a counter tendency to that inexorable law which ordains that to live is to die, has been, as will presently appear, dimly seen from times immemorial. It has however, been given to Mr. Bragg to utilize the great fact for the benefit of mankind, in a manner to be shown hereafter.

Charcoal, of course, has always been more or less known as an excellent antiseptic. The part which the vegetable plays in the great economy of the universe, underlying as it does every section of organic life, has been more or less perfectly perceived for generations. But the knowledge that in the solid wood itself resided the means whereby even the foulest diseases could be effectually baffled, life lengthened, and decay wholly arrested in its corruptive stages, has spread very slowly over the ever-widening horizon of the human mind. As examples of what vague struggles there have been after the truth in this way, I may mention that, in the fifteenth century, the Highland women in Scotland were in the habit of burning wood, and giving their husbands the ashes to swallow in draughts of water whenever they were suffering from any choleraic affection. Many travellers, too, have noticed, in the depths of Africa, parties of savages sitting round wood fires, waiting to accumulate ashes, which they would greedily take as a medicine, and that with a palpable benefit to themselves.

It would seem, indeed, as though charcoal were naturally sought, almost in the same way as salt is, wherever nature is left to her own instinctive promptings. Mr. Bragg, however, deserves that full credit which belongs to the first, to gather up into an intelligible system the *disjecta membra* of that rudimental vital science which has lurked so long among savages, and been only dimly perceived by the civilized and educated man.

In countries where, as in the East, the disintegration of the tissues is so rapid, and where death follows disease with appalling swiftness, it is most essential to inquire into the fundamental constitution of the human organism. For here, under the stroke of epidemics, superficial remedies can never have time to permeate the system—radical measures can alone prevail. But prevention is always better than cure, and after a series of experiments, it has been ascertained that the human organism can be effectually fortified against all the assaults of even the most corrupting diseases—which all resemble each other in their ultimate results—hastening the disintegration of the living tissues, and thus decay can be defied during, at least, the normal term of human life.

Made from particularly choice wood, and levigated with the greatest care, Mr. Bragg's Vegetable Charcoal possesses other besides its antiseptic virtues. Entering intimately into the system, it exercises, I believe, a mechanical action during the evolution of chyle from the chyme—the humour immediately drawn from aliment—and minute as the granules are, acts on the interior membranes so as to facilitate the equable absorption of the nourishing fluid by all the proximate parts. It follows, thence, that while the entrance of the charcoal into the system instantly neutralizes all corruptive processes that may have set in, the same charcoal also acts so favourably on the assimilative functions as to enable them to derive much more nourishment from the food absorbed than they could do if unaided by its peculiar action, and the granules which stimulate the internal tissues to put forth a more intensely receptive power. Thus, on the one hand, the charcoal absolutely arrests decay, and prevents the continued action of whatever septic influences may have been operating on the system; while on the other it actually quickens the assimilative and reproductive functions, and helps to build up a fresh and vigorous frame, while eliminating from the old one every trace of decay or other form of incipient death. This double

influence is, therefore, at once conservative and formative, and wherever the use of the charcoal is persistent, the result cannot fail to build up a pure and vigorous organism.

Without the ceaseless evolution of heat, life cannot be sustained. Carbon is itself the great heat-giving principle; now, this carbon comes from charcoal—which, in the animal form, yields some 25 per cent. of the pure carbon, and in the vegetable 75 per cent.; while, prepared as it is prepared by Mr. Bragg, the percentage rises over 90. The highest medical authorities in the kingdom have pronounced a unanimous verdict of approval of the method whereby Mr. Bragg has succeeded in giving us concentrated carbon in an agreeable form; and acting, as carbon does, directly on the actual and immediate sources of the blood, it is not surprising to find that even consumption has been cured by the potency of a necessary vital principle that can thus be surely and *naturally* introduced into the system.

In a series of experiments, made with favourable substances for the purpose of generating bacteria and other very low forms of organic life, hay and other similar substances were inclosed in glass flasks, hermetically closed, and subjected to great heat in order to destroy all already existing forms of organic life. It was observed that, in all the flasks thus treated, bacteria were generated after a few days, with, however, a remarkable exception. In every case where the substance experimented on had been *carbonized*, in order to put the *bona-fide* nature of the experiment beyond dispute, no trace of life could be detected. While one lot of hay produced its bacteria in abundance, a precisely similar lot, subjected to precisely the identical conditions, with the sole exception that it had been heated too much, and thence reduced to carbon—yielded no trace of organic life. Corruption, the initial stage of initial organic life, cannot co-exist with carbon, and we may be sure that, whenever human life is once incased, so to speak, in this great antiseptic medium, it will burn until its natural limits have been attained, the absolute absence of corruption being in this case equivalent to that perfect physical purity which, accident and violence excepted, assures longevity, and deprives even death of half its horrors.

A BREWERY.

IT is a wonder to me that the late Mr. Buckle never exercised his historical ingenuity in ascertaining, according to his peculiar analytical method, how far British breweries have been productive factors in the evolution of British supremacy. If, as Mr. Buckle tells us, the watershed of a country, its geological strata, the prevalence of particular atmospheric conditions, or the possession of an exceptional flora and fauna, alone determine the place that the nation is to hold in the councils of the world, it would be strange indeed if food in all its forms were a less potent factor in the economy of nations.

At any rate he would be a bold man who denied that beer, in some form or other, does not go a great way towards producing not a few of the most distinctive of British characteristics; and there are some among us who are now beginning to perceive that the nation would be much more benefited by having some State assurance of good malt liquors—if the State must interfere—than by any restrictive measures as to the consumption of beverages to which Englishmen take as naturally as the restless Frenchman does to his sour wines.

Some such reflections as these have been suggested to me by a recent visit to a brewery whose extent and importance can best be inferred from the detailed description I propose giving of the various operations that are involved in producing what is very frequently to all of us a far greater luxury than any wine—a glass of ale or stout, when fatigue and thirst render such refreshment more welcome, perhaps, than any other beverage can be.

Externally, no doubt, Gordon's Brewery is one of the most conspicuous buildings in the Caledonian-road, excepting alone that tremendous mass of brick and stone—the model prison.

The clerks' offices, which front the main road, have more the appearance of a flourishing private bank than anything else that I can think of; while the brewery buildings themselves, covering, I suppose, an acre and a half of ground, make, with the splendid 100-feet shaft of the handsome chimney, a very striking feature in this locality, which is by no means thinly sown with large factories and colossal hives for various industries.

Passing from the counting-houses with their buzz of entering clerks, audibly engaged, as it would seem, in compiling a directory as they call over the names of customers, you first catch a glimpse of what seems an interminable vault—for loading—with square lifts going upward through the floors above, worked by steam power, and capable of carrying a goodly freight of malt liquor. The ceiling of the vault is supported by a number of iron pillars, and lighted throughout by gas. The multitude of casks, the long vistas animated by the flitting figures of men busy loading, and the total absence of anything like confusion in what seems to a stranger a confusing scene, is a good introduction into a labyrinthian kind of industry that, commencing in one sense on the upper floor of the lofty pile, permeates every floor, and finally ends in these vaults at the tail of the loading drays.

Going upwards—it is worth mentioning that, even when ladders take the place of stairs, they are here convenient and safe, as I do not always find them in my Industrial explorations—you enter, to begin at the beginning, the malt room, where you see the mouth of a great wooden hopper, into which the malt is shot, passing into a Jacob's Ladder, and from thence into the mill, where it is ground, and carried up into enormous hoppers for mashing.

Before proceeding further, I should premise that there are three distinct plants in this brewery, which is really of a triple character; and of course a description of one serves for the other two. The mouth of the hopper is something like that of a vast coffee mill. The malt travels through square pipes—exactly similar to those belonging to the largest organs—little pails working up and down inside, and picking up the malt with automatic accuracy. After grinding,

the malt is carried up into a large case and then passes through a series of machinery into the mash-tun, where it is mixed with the water. Here it becomes wort; from the mash-tun it passes into a copper; and, looking down at the heavy liquor, you will see the hops floating about the surface. This copper goes through to the floor underneath, and the wort having been boiled passes from thence into the hop "back," as it is called; it is then carried to the "coolers," or refrigerators by means of powerful pumps. The coolers are flat, almost tray-like receptacles, covering a great area in a very lofty and spacious chamber, which is not the least striking in these enormous buildings. The roof is pitched high: there is no ceiling; but the interior is one network of timber braces, while two parallel sets of louvre windows serve to ventilate the space below in a most perfect way. These immense shallow tanks as they seem, where miniature lakes of "liquor" are run out to cool, form a striking picture. Here, as elsewhere, the most scrupulous cleanliness is strictly observed, the least failure in this respect resulting in totally destructive consequences to the beer long before it would reach the consumer.

From here the liquor passes through a long pipe into the "fermenting tuns." These are in a large and lofty chamber high up in the building, and, on some accounts, perhaps the most immediately interesting of all the many departments in the whole brewery.

Imagine a long chamber with an avenue down the middle between two rows of great vats sunk in below the floor or stage on which you walk, and even then coming up so high that, were it not for a square opening cut in the side next you, it would not be easy to peer into their uncovered contents. Look inside: there is a great heaving mass of rock-like crystal displaying an amazing variety of yellow and brown shades. Here is a fermenting tun which will, in due season, turn out a very excellent single stout; now the whole interior is one mass of, as it seems, crystallizing snow. The opening in front, through which this curious process, so picturesque in its details, can be seen, is, when necessary, closed by what is termed a yeast board, which prevents a too vigorous fermentation from overflowing. I am sure that in some of these fermenting tuns the heaving surface presents everywhere variegated colours fully as beautiful as many of the best specimens of mosaic stonework that the Geological Museum, Jermyn Street, can show.

These vats are constructed of wood. They are here mostly round, but there is a square one now empty with a ladder standing inside. It has just been thoroughly washed out, and is quite worthy of the housewife's highest eulogium on cleanliness of this kind—namely, that you might eat off the boards. After the incipient ales and stouts have been here a certain time, they are run into casks below, where they remain until ready for racking off. All the yeast is not worked off above.

In another of those immense chambers which compose the colossal cells of this great industrial hive you see long rows of casks standing on a connected series of wooden troughs in such a manner that whatever is expressed from the casks themselves is caught in the trays or troughs beneath them. Most of them have great excrescences of yeast slowly oozing forth from the vents and collecting in the clean receptacles beneath. This is brewer's yeast, and is then ready for selling to the yeast merchant.

There are here, from end to end, steam pipes to maintain a suitable temperature in cold weather, while a smooth floor of asphalte renders the great attention to cleanliness observable throughout more conspicuous here. As soon as the casks have thrown up all their yeast, they are rolled on to the lift and passed down a stage nearer their ultimate destination —the cellar of the consumer.

From this department I visited the engine-room, and inspected the powerful machinery which sends its iron dictates with unerring precision throughout the whole building wherever automatic can be substituted for human labour. The boiler is of 40-horse power. There are three fine pumps, which force the worts out of the hop "backs" into the coolers, and, in correspondence to the triple plant of which I have spoken, are two more fine Cornish boilers of 40-horse power, and a small engine for cutting chaff for the horses belonging to the establishment.

The coal store is worth glancing at. Above 100 tons are used monthly, and the rise in the price of fuel is, as might be supposed, very perceptibly felt in this portion of a brewer's economy.

The stables which run round part of the great courtyard inclosed by the brewery buildings, are in themselves a sight well worth seeing. You might suppose them to be cavalry stables at first sight. They were empty, a few cases excepted, where a sick horse or two were invalided, generally in

loose boxes. As might be expected, with close on sixty stalls, there are usually one or two horses ill or hurt. Above the stables is a loft—well-lighted and even lofty—where there are cutting-machines for chaff. This, indeed, is quite a little industry in itself. The prepared provender is shot down a shoot into the stables below and then placed on a hand-carriage and wheeled along to each stall.

There are, too, a farrier's shop, wheelwright's shop, harness-maker's shop and a cooperage—where, however, only repairs are done—and a cask-cleaning shed. Here the cask is placed on the top of an inclined wooden railway, the bung turned over a cock and an irresistible jet of boiling water injected with terrific force. The man engaged in this duty is pretty well fortified in a leather apron, and takes care to keep clear of the stray steam jets, but a stranger had best keep his distance during this process. The casks are examined very minutely after this to ascertain that they are thoroughly clean.

In order to guard against fire, three hydrants in connection with the New River are placed advantageously on the basement, and sealed to prevent their being tampered with, and in a few moments a mighty deluge of water can be lifted to the very summit of the building itself.

There is a washing-room and a bottle department, where you see gigantic piles of serried grosses of stout and ale continually growing as the busy bottlers add row to row. A new hop-room for storage is suggestive in its vastness, for six hundred "pockets" represent a great flood of malt liquor. The walls, ceiling, floor, and doors are all, as far as practicable, hermetically close, in order to baffle that tiny, but often very destructive, foe to the brewer—the mouse.

Certainly the interior of these premises—down to the most minute detail—is in perfect correspondence with the neatness and finish of its exterior; and it would, I am sure, be very comforting to know that all the immediate sources of our manufactured foods and beverages were as well ordered and, above all, as cleanly kept as the Gordon Brewery, who number among their patrons Her Majesty the Queen, the Prince of Wales, and other members of the Royal Family.

Something like 150 persons are employed in the Brewery, while an office staff of thirty clerks is required to record the commercial consequences of their incessant labours.

MUSTARD-MAKING.

THERE are perhaps few examples more striking of the beneficent advantages arising from the co-operation of consumers on the one hand, and the concentration of manufactures on the other, than those afforded by that, to all of us, familiar object, the family cruet-stand. A pinch of salt, a sprinkle of pepper, a patch of mustard—what do they not represent? Deep mines in Hungary, Poland, Cornwall, and elsewhere; great shallows in Western India covered with snowlike crystals, and reaped by industrious thousands. Entire islands and considerable fleets are exclusively devoted to our pepper-castor; virtual breweries, rivalling those of our Barclay and Bass, for our vinegar-cruet, and, as I shall presently show, as much or more may be said of mustard itself.

London about the Mansion House is now a striking medley of the ancient and the new. In the midst of so many palace-like offices, resulting from the present City improvements, there are still many old factories; and on Garlick-hill stands one of the oldest. The factory, indeed, of Messrs. Keen, Robinson, & Belville, may be roughly divided into three sections, two separated by a private bridge over the Metropolitan Railway, and the third—chiefly devoted to storage and tin-making—is in a lane called Kennet-wharf-lane. I observed the old church of St. James's, which still displays that well-known sign of the crusading times—a scollop-shell; but it seems that the nearness of this church, and the fact that a shell was once used for scooping out mustard, led to the before-mentioned firm adopting for its trade-mark what was once to the Pilgrims of Palestine a passport of peace and honour in Western lands. Externally

the factory is quite as imposing as most breweries, and the loading floor, as I happened to see it, gave a good preliminary idea of the extent of the operations conducted by the firm. At the moment in question, a waggon was delivering show-cards, those bright pictorial representations of fruitful corn-ears, which remind us of the part that Robinson's well-known preparations play in the economy of the great mustard-house; and all around I saw massive piles of filled boxes destined, however, to be consumed as rapidly as the piles of seed-sacks that accumulate only to be dispersed with a rapidity that might make one imagine that strong mustard-and-water baths were of daily occurrence in every British home.

On the second floor of this section of the vast warehouse were huge piles of sacks, containing mustard seeds; while I noticed a machine for sifting away the dust and refuse inseparable from all grain. A sieve works backwards and forwards by machinery; and while the seeds fall through, all the foreign matter is perfectly eliminated.

On the third floor there are again storage of seed-sacks, where a pleasant aroma leads one willingly enough into the spice-room; the lift running through every floor greatly facilitates the labour of dealing with such immense stores.

Thence I passed into a packing-room full of boys, where the glitter of the tins, the brilliancy of the labels, the pungent, but by no means disagreeable flavour of the air, and the railway rate at which the juvenile operatives were labouring, combined to make the whole a very animated picture. The tins are from ¼ lb. to 12 lb., while the great bins of mustard whence the busy packers help themselves, give a characteristic colour to the whole.

There is a similar floor for the country, and one for the export trade, where rows of casks by the hundred, give the whole scene a touch of the brewery.

Iron doors separate the different sections of the establishment, affording great protection against fire, and also a means for maintaining the high and equable temperature requisite in certain parts of the factory where indigo is drying for washing-blues.

Thence you pass over a private crossing of the Metropolitan Railway, which affords a fine means of seeing to advantage the largest show-board, I believe, in London, containing the legend of this ancient firm, and representations of some of the prize medals that have been won by Keen's mustard.

There is a chicory-room, with great bins full of the root, which is here roasted a dark brown. The chicory is ground in a mill, similar to those I have seen employed for grinding cocoa. Thence I went into the Blue Department, as I may term that devoted to the preparation of washing-blues.

Nothing, perhaps, can well exceed the brilliancy of the ultramarine here employed. I passed from room to room between avenues of racks rising far over my head, filled with countless tiers of shallow trays containing blues exposed to hot air for the purpose of desiccation. The atmosphere was just pleasant, and the effect of pacing for hundreds of yards, as at all events it appeared to me, among these lofty racks of drying blue was very striking. It is impossible to refrain from curious speculations as to the amount of family washing that these multitudinous trays represent; and yet they are quickly emptied, only to be refilled as quickly. Here on an upper floor, in a well warmed and lighted room, is a somewhat curious sight. Seated at square, rough deal tables were the men engaged in making blue-balls for the laundry. In the centre of each group is a great lump, looking like blue putty; the workman then rolls out between his palms a large piece of the composition until he has fashioned a long flexible rod, whence he pinches off pieces for rolling into the familiar balls of every laundry. These are made by rule of thumb, and the accuracy with which a yard of blue is made to furnish the proper number of balls is surprising. The indigo-blue is made up in the form of cakes and figs (what is known in the trade as "thumbs"), and it is somewhat curious to find that different districts in England take different shapes, and under no circumstances can the cakes be made to sell in the "thumb" locality, or *vice versâ*. There are rooms on rooms of indigo and ultramarine drying in the trays; while below are numbers of casks containing the raw material in lumps, and representing a considerable amount of money. The beautiful lustre which we see in these blue-cakes is imparted by a process called "rouncing." A great copper vessel is filled with the indigo, and it revolves round till the requisite lustre is obtained. The colouring matter—indigo or ultramarine—has only to be mixed with pulverous substances to give it the proper consistency for rolling into balls or making into cakes, and with this and the necessary desiccating process mentioned above, the manufacture is complete.

As to the mustard, its manufacture is indeed simple; the

seeds are received in large sacks and hoisted up, much as malt in a brewery. Screening, or sifting, and fine-grinding finish the work. There are many screening rooms; several large sieves, depending from chains attached to movable beams above, and connected with the steam-engines of 50-horse power which do the work of the whole factory, move, or are rather jerked, backwards and forwards with great speed over receiving-bins. There are men about, here and there; but, beyond feeding the sieves, the whole labour may be termed automatic, and it is much to be doubted whether our mustard at home is mixed half as cleanly as it is manufactured.

At Kennet Wharf, a few minutes distant, is another pile of the factory. On the first-floor there is more mustard-screening going on, and on the top is a very long room, full of flash, fire, and noise. The whole floor is strewn with shreds of glittering tin; long vistas of whitesmiths' benches are relieved by the fitful flare of portable furnaces. There are stamping and cutting machines in full activity, and while you pass down the deafening avenue numbers of little canisters have been cut out, moulded—that is, shaped over a piece of wood—and made ready for soldering. A separate manufactory, you would say. Nothing of the kind; only tins and canisters actually required for packing Keen's mustard are here produced; and no other feature, perhaps, of the factory impresses one so much with an idea of the immense quantity of the popular condiment consumed amongst us. There is something almost patriarchal about this useful industry, which has endured for not much short of a century and a-half. There are workmen here representing three and four generations of the same family. No doubt mustard has some excellent sanitary properties; and its manufacture, where there is no adulteration, is, as I have shown, simple as easy, involving little or no hard labour to the operator. The firm possesses some interesting archives, dating back to times very different from these. I was shown an invoice of some mustard consignments, addressed to a Mr. Notcutt, Bristol, dated 1787, written on thick, tough paper; the ink remains singularly black—a circumstance not to be anticipated of modern invoices. Those who have gone over these works, will, perhaps, like Grumio, in the "Taming of the Shrew," respect mustard, even when beef is out of the question.

VINEGAR-MAKING.

MACHINERY and chemistry represent, one might say, the muscle and intellect of that permanent progress which alone constitutes true civilization. Interwoven and interdependent as these two great agencies for supplying the necessities as well as furnishing the luxuries are, the analogy is in all respects good and just, as the development of intellect renders the same expenditure of muscular energy more productive than before, so does the advance of chemistry, as a science applied to our vital wants, render the application of mechanical forces to the service of mankind inconceivably more potent than could have been imagined even possible in the days of Watt or Franklin. Few of my readers probably have a much better notion of what vinegar works really are than had George III. of the manner in which an apple dumpling was produced. And I think, therefore, that the manner in which one of the most important bottles of our cruet-stand is filled, may be new as well as interesting to many.

Passing under the familiar gateway in the City Road which bears the well-known name of "Champion," you soon find yourself involved in the precincts of various warehouses, cooperages, store-rooms, gigantic vats, built up to the dimensions of moderate-sized Martello towers, machines, presses, grinding-mills and immense stills, until it seems impossible to organize such huge and apparently disconnected fact-impressions into one harmonious idea.

It may surprise some to learn that the earliest operations in the process of vinegar are identical with those

of brewing. On the upper floors of the works the malt is stored, poured down into capacious receptacles, ground, and then shot into the mash-tuns. These are great vessels with a stirrer worked by machinery. Formerly this operation was facilitated by great rakes, worked by manual force, and with, of course, but a limited effect in respect to the toil of the panting labourer. Some of these terrible tools of a bygone day hang on the walls, rusty and hideous, and may serve to remind discontented industrials of the hardships once submitted to by their class without question or cavil. Well, indeed, might the presiding genius of our present industrial times exclaim on beholding such clumsy and arm-dislocating implements:

Non sunt hæc digitis arma tenenda tuis artifex!

The quantities of water required are, of course, regulated according to the character of the "wort" wanted, and here, as in every successive stage upward, intelligence alone enables the workmen or operators, as we might better call them, to avoid blunders that would sometimes be of a most costly nature. As soon as the mashing is completed, the liquor resulting thence, *i.e.*, the "wort," is permitted to pass through pipes into the "underback," which is an immense tank, and then comes the delicate operation of cooling. The great object is to get a large surface acted upon, and for this purpose a convoluted piping is employed. As soon as the refrigerating process is concluded, the wort is conveyed into vessels and left to ferment in stove-houses. Here, in a very high temperature, the simple action of the oxygen in the atmosphere on the wort begins to turn it into acetic acid, the surface of each cask or vat of the fermenting liquor soon forming into what is termed the vinegar plant. Fermentation has long been, as it is still, one of the most secret of nature's operations, and its close relationship, as in the formation of this superficial vegetable growth, to life itself, is one of the most perplexing problems of the physiologist. It is very singular too, that of a row of vessels all filled exactly alike and exposed, as far as an expert chemist can ascertain, to precisely the same conditions, one or more will obstinately refuse to throw up the superficial vitality which is, we are scarcely surprised to hear, regarded by the more ignorant of the persons employed as something mysterious, not to say supernatural. Formerly the aceti-

fication was performed through a process called, technically, "fielding," and sometimes months were thus consumed. The plan of "stoving" is much more rapid and certain, and can be more scientifically regulated. The atmosphere in those fermenting rooms is something frightful, and only those thoroughly inured to it can bear the pressure of the acetous vapour more than a very few minutes. As soon as the acetification is finished the vinegar is made, but before it can be used some considerable amount of cleansing is required. For purification it has to be filtered through great towel-like casks filled with what is termed "rape," and which consists of raisin stalks and skins. These "vats" have false bottoms to carry the filtering medium. By means of forcing-pumps the vinegar is made to filtrate again and again through the raisin-stalks. The constant circulation engendered by the steady and unremitting action of these manifold pumps is somewhat analogous to that produced by the beating of the human heart, when, at each pulsation, it casts forth arterial and so to speak purified and filtrated blood to return again by a series of channels absorbing in its path through the veins the impurities of the sanguinary system. As soon as the vinegar comes out transparent it is "made," and ready for the store-vats. When we inform our readers that there are but half a dozen vinegar-manufacturers in London, and that considerably upwards of a million and a half of gallons are turned out annually from this firm alone, they may form an imperfect conception of the magnitude of those operations on which the filling of not the least important of the family cruets depends.

As to the actual operatives in these works, it must be remembered that the processes once begun are necessarily continuous, so that the men engaged in such operations as filtration go on in relays and work the twenty-four hours through. Few unskilled labourers are employed on the works, where during the pressure of the season some 170 persons are engaged in this domestic chemistry.

Few persons would suppose that vinegar-making branched out as it does into other chemical operations. Here acetic acid is manufactured, a process of a costly character, as the strength of the acid renders it necessary to employ silver largely in the various vessels and stills.

The uses of vinegar, it is needless to remind our readers, are as numerous as they are productive and beneficent.

Bad water purified by adding a little vinegar, and the advantage that Frederick the Great derived from making each soldier supply himself with this powerful agent, served to preserve thousands of men from the deadly effects of forced marches and unmedicated ditch water. In summer time there can be little doubt that the infusion of vinegar in water would be a most desirable drink for those labouring hard, either without or within doors. Checking perspiration and so economizing the expenditure of muscular tissue, and assuaging thirst in an agreeable manner, vinegar would undoubtedly be the poor man's friend. Vinegar has already served as an admirable anti-choleric potion, and in the extensive works of Messrs. Champion & Co., there are, indeed, casualties sometimes and deaths from old age, but there is, we are assured, practically, no illness.

I can hardly conclude this mere passing notice of such a celebrated manufactory as that of Messrs. Champion & Co. without reflecting for an instant on the associations necessarily connected with such an old established commercial enterprise. Flourishing when Marlborough fought at Blenheim, and familiar as the "vinegar ground" has been in bygone days to generations before us, it is pleasing to think that an industry commenced then, still exists, and that exactly a similar article of manufacture is alike requisite to us inhabitants of to-day as to our ancestors nearly two centuries ago. Whilst the production of the speciality has necessarily increased, the "vinegar ground" has, from modern improvements and the utilitarian requirements of the age, necessarily decreased, its expanse of meadows has given place to densely populated streets, yet sufficient remains in the vastness of the premises and surroundings to impress an observer with the magnitude of the necessaries which are at the present moment required by this eminent firm in the production of such an unthought-about article of our daily wants as vinegar.

COFFEE.

THE industries directly or indirectly involved in the culture of coffee and the preparation of the berry for use are best inferable from the simple fact that more than twenty years ago—1852—the annual consumption of the United Kingdom was 35,000,000 lb., while the total annual European consumption may now be moderately put at 200,000,000 lb. It is, therefore, evident enough that whatever seriously impairs the natural good qualities of the plant and still more factitious substitutions for it in part or whole cannot fail to work incalculable mischief far and wide.

In 1873 I had the privilege of seeing at the French Coffee Planters' Hall, 140, Strand, a cafetière at work, which, by the ingenious use of a siphon in perfecting the percolation of the coffee, turned out in a few moments a cup of coffee, which seems to me such a true domestic desideratum as to deserve some special notice.

Before, however, going farther into the details of the excellent invention of Picard & Co.'s cafetières, it is well to refresh the memory of my readers on some important points regarding coffee generally. Although its geographical range is extensive, the Arabian variety, which has been in use since 875 B.C., is justly esteemed as the finest. That its use is not as general as its quality is high is shown by the fact that only perhaps the minimum part of the coffee consumed in this country, except, indeed, the coffee prepared by Messrs. Picard & Co., is supposed to deserve the name of Mocha. Briefly stated, the properties of this beneficent plant are calculated to counteract languor,

soothe the body, give tone to the nerves, quicken and clear the action of the brain, and—most important, perhaps, of all—check to a very great degree that constant waste of tissue which is ever breaking down that most elaborate of all complicated fabrics, the human body. All these effects—often invaluable in their results—spring from the common or separate action of three distinct principles peculiar to the plant—that volatile oil which issues from the roasting, the tannic acid which the roasting modifies, and finally the *caffeine* itself. The volatile oil, whence comes the welcome aroma, is not produced in great quantity by torrefication. On the contrary, as M. Picard says, it approaches in its precious minuteness attar of roses. In the best-roasted coffee—and certainly that torrified by Messrs. Picard & Co. is unsurpassable—the proportion of volatile oil is about 1 lb. in 50,000 lb. My readers must, therefore, perceive how much depends on the honesty of the preparation of the coffee for domestic use, since it is on the different proportions of this oil contained that the aroma, and thence the value of coffees, depend. A very large proportion of the volatile oil might even make the coffees of Ceylon and the East Indies nearly equal to the finest Mocha. At any rate, I understand that, could the oil in question be purchased, its market price would exceed £1,000 a pound.

This invaluable oil is formed during roasting, and exercises the most salutary effects on the system of those who have the good fortune to drink unadulterated coffee scientifically percolated.

Although rarely, perhaps, thought of when considering coffee as a staple of life, its direct medicinal virtues must not be overlooked. Among other ills to which flesh is heir which have yielded to the curative action of pure coffee, well roasted and properly made, some of my readers may, perhaps, be surprised to hear that a principal one is gout. I have found, however, that this is really the case, and a reference to the 13th vol., page 330, of the *Pharmaceutical Journal* gives in detail the interesting case of a gentleman who was completely cured, after suffering for years from chalk-stone in the joints, by a judicious course of well-made Mocha coffee.

In days like these the merits of any beverage which at once soothes the muscular and invigorates the nervous system, allays the hunger without injury to the digestion, arrests the waste of the body generally, without impairing

in any degree a single function, and quickens the intellect without incurring the penalty consequent on ordinary stimulants, cannot be too highly praised. To professional men, to artists, to authors, and *id hoc genus*, how large a class! I consider the scientifically prepared coffee of Messrs. Picard & Co. an invaluable boon. There are many occasions when to eat is, through resulting digestion, fatal to sustained mental effort, and yet not to eat is to produce a more or less injurious exhaustion. It is then particularly that a coffee like that I have tasted, is *the* desideratum. Possessing a bouquet which in

> Its cream-like softness seems to be
> Arabian perfumes in epitome,

a tonic restorative property, and a perfectly pellucid taste—even when of extreme strength—I believe no coffee deserves to be so popular, and certainly none would be found in practice so truly economical as that which Messrs. Picard & Co. are now producing. Of course, in all cases where adulterated articles obtain extensive use for a long period, the fault rests at last with the public, who so readily permit themselves to be duped by the practical falsehoods which result from their own deceptive taste, carefully vitiated long since by the interested vendors of cheap rubbish. Still it is beginning to be apparent to the trading mind that honesty is in all things the best policy, even from a balance-sheet viewpoint, and grocers generally would undoubtedly find it immensely to their future interest to substitute pure for factitious coffees. To those who may have the good fortune to initiate the extension of Picard's coffee into a really popular consumption, something besides a clearer conscience, commercially speaking, is perfectly sure to constitute a very satisfactory reward. It is, therefore, satisfactory to learn that numerous agencies have been already appointed, being readily taken up by all the leading family grocers and Italian warehousemen throughout the United Kingdom. Meanwhile all who try this exquisite Mocha for the first time, scientifically blended with four other qualities of choice growth and roasted simply to perfection by a process peculiar to Messrs. Picard & Co., will agree with me that previously they did not know what good coffee was; and if the historic British tar, who in 1854 first drank a diminutive cup of coffee at Stamboul, and immediately ordered half a dozen cups, should visit the French Coffee Planters' Hall, he will not, I am sure, order less than six dozen!

MACARONI-MAKING.

WHETHER there be an antagonism or not between Science and Poetry, it is indisputable that the inspirations of the latter have, in some instances at least, anticipated, and even facilitated, the discoveries of the former. It has always seemed, at least to me, that the well-known assertion of one of our religious poets, in a poem addressed to his wife, that

> She was so finely wrought,
> That one might almost say her *body thought*,

foreshadowed, even if it was not meant to convey, a profound physiological truth. It must be evident to all that human life is exclusively expressed by material agencies, mechanically disposed, and through material mediums resulting, to be brief, from art or nature.

At all times, but more especially the present, the question of food staples is of the first importance. England has been reproachfully termed the workshop of the world; but, if the Darwinian idea has a manufacturing as well as a natural history application, we may presume that, as locomotion improves, even more than now the raw material of the world will be passed through English mills and presses. Every country has its staple food, and is generally found to excel in its preparation. I have always thought myself that to epitomize in its edible products the world generally, in a particular country, was a great achievement; for, of course, the gain to humanity is obvious, supposing every country could do this. In those exports of food staples, which the West now sends to the East, we see the initial phases of changes destined some day to aid materially the cause of universal

civilization, progress, and peace. We are all familiar with the fact that Italy's bread is macaroni; and though it is beginning to be extensively used here, it surprised me to find that there was a British manufactory as well as a British consumption. The dreadful famines of the East had led me into a comparative inquiry into the value of the principal cereals. Hearing that Anglo-Italian macaroni could be economically manufactured and kept fresh for over a year, and that the form could be accommodated almost *ad libitum* to the special exigencies of sea or land carriage, I visited the works of the Anglo-Italian Macaroni Company, in Camden Town, where these operations are now in full activity. You first enter a kind of granary; it is difficult to find a passage among the pile of sacks of semolina flour (Italian—and according to some the finest—wheat). Semolina is *flour* prepared from the hard wheat of Apulia or Sicily. The company's mills are at Castellammare, where the semolina is manufactured. The flour is ground at Naples in the company's mills, but though good enough for bread it is not yet deemed fit for macaroni-making; it has still to be winnowed. The great object is to retain the whole of the gluten and exclude a portion of the starch, by which means the percentage of nutriment is increased. Here you can see sieves of the sifted wheat realizing those visions we form of gold-dust, which are so cruelly disappointed when we first handle a sample of auriferous earth. Let us pass to the mills. This extra winnowing is very effectual. A large cylinder, covered with gauze, revolves inside a large chest by manual power applied to an external handle. There can be, I think, no doubt that macaroni possesses advantages over even bread. The Anglo-Italian kind is really made of concentrated gluten; the only ingredient is water. Thus many doubtful and noxious substances common to bread are wholly absent. Then, again, bread as a staple of the meal is not inviting. A few slices of bread, boiled in water and eaten with salt, scarcely furnishes a pleasant bill of fare. A pound of macaroni treated thus may be deemed bread and meat in one, and forms an agreeable and nutritious meal. The paste receptacles are two enormous basins, hollowed out of the hardest wood, and standing on dwarf pillars of the butcher-block character. In each are two immense vertical marble millstones, revolving round an upright beam, and driven by steam power. The actual manufacture is confined to this room, and is as follows:—

The wheat—gold-like in its nutritive wealth—is poured into the basin, water added, and the immense crushing wheels set in motion. A paste of proper consistency is to be kneaded. One or two men—Italians—attend each mill, and as the paste flattens under each revolution, pile it up again in front of the returning marble. Practice has taught the proper degree of consistency. This attained, the macaroni is really made. A simple manufacture, the reader will say—easier than pudding-making. Yes, but the macaroni is inchoate, amorphous—the formative process is still to come. So far, we have food without hands almost. It is so with what is yet to come. In correspondence with the kneading mills are several singular machines of polished steel, and connected with the same machinery that drives the former. Imagine an ordinary locomotive cylinder placed vertically at some little distance from the ground, with a perforated base, and the usual piston. It must be obvious that, on the advance of the latter, whatever may be inside, must be expressed through these orifices. That is the *modus operandi* of mechanical macaroni-making. The rest is merely detail. A mass of kneaded paste is forced into the cylinder, the steam turned on, and the cylinder descends with an irresistible power. If you stoop a little, you will see a number of milk-white stems appearing through the lower plate; it is soft to the touch. Gas jets keep the cylinder warm, rendering the paste within more plastic.

As soon as those white pipes have slowly grown some little length, they are cut away as waste. This serves—though the cleanliness of polished metal hardly needs such care—to wipe the orifices. A clean wooden tray is thrust beneath. Formerly a man sat down on the floor, armed with a fan of portentous proportions, for the purpose of cooling the macaroni as it was slowly expressed through the orifice. Since, however, the introduction of marble crushing-mills, this has been no longer necessary, as the paste comes out too dry for the pipes to adhere as they formerly did.

The old method, indeed, was that of kneading, through the primitive agency of a long pole, ridden by men, who often fatally injured themselves through their exertions in obtaining a proper consistency. It is clear that it was impossible by such rude means to extract the superabundant moisture, and thence in moulding afterwards fanning was requisite to prevent the pipes gluing together in a tangled mass. So soon as a sufficient length has grown through—the process

resembles the inverted growth of white reeds—a crop is reaped off and folded over a long cane, if of the pipe kind, or laid in trays if intended for twists.

These formative cylinders, indeed, resemble short specimens of Armstrong guns. There is one placed horizontally; this is for cutting fancy devices in macaroni designed for soup, &c. As the piston irresistibly drives the paste out through the orifices at the other extremity, a knife-blade revolves round the perforated plate, as a hand might round a watch face, and cuts off the projecting paste, which falls in a starry shower into a box placed beneath for its reception.

The new-made macaroni is conveyed to the drying-rooms, while that portion intended for fancy patterns goes into a long room, where a number of girls plait and fold the flexible tubes with astonishing dexterity. The drying stages are entirely open to the air on one side, a projecting roof and awnings, when necessary, giving sufficient protection against the weather. The interior of this singular and airy apartment is crossed and crossed with canes, each bearing its pendant fringe of long macaroni pipes, or else the space is occupied by trays, resting in racks, containing the fancy shapes. Here the process is completed, the air doing all that is now required. After the macaroni has been properly dried, it is packed in tins and boxes, where it will keep for months and even years, without becoming uneatable. It must be obvious how great an improvement has been effected by transferring the manufacture to England, where English machinery is supplemented by Italian skill, for the men employed are Neapolitans.

Considering how many difficulties which formerly stood in the way of macaroni-making have been overcome by the application of machinery, and the fact that the paste can be produced in any shape that may be most desirable for special purposes, while a high nutritive power is insured by the extraordinary winnowing of the very fine wheat employed, it is obvious that the use of macaroni is capable of very great extension. The tremendous pressure of the ponderous marble which slowly rolls the paste over and over again, surely eliminates thence all superfluous moisture.

At the International Exhibition of 1873, the Anglo-Italian Macaroni Company exhibited its processes, which excited more interest than any other food manufacture shown in the building.

PURE WATER.

THE famous old Greek who found an aqueous origin for everything mundane was by no means so wide of the truth as many suppose; at any rate, he guessed something more than a half truth, and all succeeding science has ever shown that water, in some form or other, is the one prevailing characteristic of the material universe—man himself included. Almost all bodies, organic no less than inorganic, contain water in considerable proportions, and its mechanical conservation in this great natural factory—where sunshine, cloud, and wind are divinely co-ordinated—is certainly one of the greatest marvels of creation. Solidity, indeed, in its common acceptation, consists more in fancy than in fact. A homely example is furnished in such a simple thing as lean beef, which analysis, as any one may see for himself, at the South Kensington Museum, proves to consist of, out of 100 parts—fibrine, 19; fat, 2; water, 78. It is easy, indeed, to find examples of this great fact—the interpenetration of water with almost all known substances. An egg contains 74 per cent. of water, the potato 75, the carrot 83, and the turnip 99. Without, however, multiplying examples, it is safe to say that initially the marvellous universe of nature and man are constructed chiefly out of the gases nitrogen, oxygen, and hydrogen, of which the two latter are the constituents of water. It must then be obvious that, this being the case, under circumstances of unceasing change—of which evaporation and condensation are but two out of innumerable forms—water is just that substance which is most likely to epitomize in its particles the basis of all other natural forms, organic or inorganic. Water, indeed, is the great motive

force of the globe, and the steam power of the world is after all insignificant to

> The might majestic of the sunshine soft,
> That lifts a river to the sky aloft,
> And deep in clouds, in awful beauty spread,
> Stores up the showers that give the nations bread.

Viewed, then, comprehensively, and in the strictest accordance with the ascertained facts of science, it is obvious that water more than any other necessary of life, air alone excepted, has, so to speak, the very widest range of contiguity and interpenetration with all points and parts of the physical universe. It is as obvious, too, that in circulating blood-like through the entire range of the natural world, water in its receptive mobility necessarily becomes more or less permeated by a variety of foreign bodies, some, indeed, harmless, but others highly noxious, while a few may even be deemed desirable as constituents in water considered as a beverage. Consisting, as water does, of oxygen and hydrogen, it is to be borne in mind that these are also the main constituents in animal and vegetable life, and water chemically supplies these gases in a manner which no other liquid could serve equally well. Hence it is true, if paradoxical, to call water a species of food. Broadly speaking, water, as we naturally obtain it, is necessarily contaminated. As rain it washes impurities from the air itself; in the river it contracts various qualities from the bed over which it flows. The Iceland glaciers and the steeps of the Andes roll down a milk-like flood; in the Rio Negro of South America an excess of suspended vegetable matter is shown in dense black billows; in the Iceland geysers, again, water is green, and even where it has a crystalline brightness there will still be saline and mineral matter in solution.

The perfection of water, however, lies in its purity. There is for this a physiological reason. As I have hinted above it is on the easy interpenetration of this necessary fluid with organic structures that the maintenance of the latter in their integrity mainly depends. This, however, brings us directly to the nervous system, which could never endure long that constant and universal irritation which every organic body would sustain were the water entering into its constitution largely mingled with adventitious substances. But water, which has to penetrate the most delicate tissues of the body, is essentially destitute of pronounced qualities,

We may perceive, indeed, that in ministering to our structural needs the importance of having the water we drink as pure as possible is of more than a passing importance; and when we reflect on the subtle manner in which water is absorbed by the human body, it is evident, too, that this care should not begin and end merely with water regarded as a mere beverage.

We all know how epidemic disease has been traced distinctly to impure water; but it were a great mistake to suppose that in shunning, as so many do, water itself as a beverage, and only taking it after it has been in some way subjected to the action of fire, we have done all we need do in a sanatory sense, so far as water is concerned. Even for washing, water cannot be too pure, and undoubtedly were two extreme cases of pure and impure ablution, by way of experiment, the result would show that pure water for personal ablution should be rather held a necessary than a luxury. Of course my readers understand that here I use the word "pure" as implying something altogether different from what is meant by merely "clean" water. All this has been brought home forcibly to me by a visit recently paid to the head-quarters of the London Water Purifying Company, where I have had an opportunity of inspecting their filters, which are in many respects deserving of special notice. The plan of the filter for cistern purposes is simple. An earthenware vessel with a perforated bottom, raised slightly on feet, is placed inside the cistern. The filter is filled inside with animal charcoal, through which the water, admitted at the bottom, passes, and a pipe at the top conveys the filtered water to the usual tap. There are some obvious advantages here. First, the water is forced up through the filtration bed; secondly, a constant motion is maintained, so that the water drawn off is not, as is too often the case with filtered water, insipid, consequent on stagnation; thirdly, the supply is always good, as there is no waiting for the filter to act, while by an ingenious but simple arrangement, if it be desired the rate of filtration can be retarded so as to increase its intensity. A variety of substances have been employed in filters, but experience has now conclusively demonstrated that charcoal is the best of all. Sponge, for example, is a most objectionable medium, for, like all organic substances, it is subject to decay, and when once surcharged with impurities renders the water passing through worse than it was before. By the admirable

method adopted in the ingenious filters of the London Water Purifying Company the water is filtered at the last moment, and thus is *fresh;* while by the siphon action the process goes on of itself. It is well established now that such substitutes for animal charcoal as sand, porous stones, sponge, &c., merely intercept gross impurities in *suspension*, whilst those in *solution*, which are often the most serious of all in their effect on the human economy, escape filtration altogether, and thence people may be copiously using filtered water which contains in reality a quantity of organic or other matter in solution.

The highest authorities on chemistry—including Professor Frankland, Dr. Letheby, and Dr. Hassall—in its physiological application to human organisms, concur in their testimony as to the vital importance of pure water, regarded as an indispensable solvent and vehicle of the food on which we live. They also agree in pronouncing these self-acting charcoal filters the best possible forms for rendering water as pure as any known scientific process can make it.

Already in making the earthenware receptacles for the charcoal a very large industry is included in London potters' work. These filters are also made of a size sufficient to become cistern and filter in one; while, in the case of such supplies as those required, for instance, by brewers, any amount can be filtered, as metallic filters can be inserted in the tanks of a size competent to maintain the largest water supply that can possibly be needed. There are also handy little pocket filters for tourists and travellers, which greatly excited my admiration, and will no doubt before long carry the fame of this most beneficent enterprise to the Ataligh Ghazee himself the next time we send a mission to Yarkund, or perhaps make the characters "London Water Purifying Company" a familiar spell, insuring longevity to the Kaffirs of Natal or the multitudinous races of Zanzibar.

Remembering how intimately water enters into every part of the human economy, serving a variety of mechanical and chemical purposes, the purity of the water we wash in, cook with, or drink as a beverage by itself, becomes of primary consequence. Who can doubt for a moment that if every cistern in the kingdom, every tank in the naval and mercantile marine, were provided with one of these self-acting charcoal filters, there would shortly be a marked improvement in the public health and a marked decrease in the death-

rate? Nay, more than this. Such elaborate investigations as those continually being conducted by men like Professor Huxley, Dr. Forbes Winslow, Mr. Herbert Spencer, and others, show how close is the connection between mind in its manifestations and the character of the fabric wherein the operations of that mind *must at some point begin to be mechanically* conducted. Although, indeed, I do not accept the assumption of these profound thinkers of our day as to the origin, still less as to the destiny, of humanity, it is impossible to resist one conclusion from facts they have already well established. Every one will admit that Mr. Millais could not *express* the same art-thought so well with a bit of burned stick on a white wall as he would with his own brush on the proper canvas. Here, indeed, we may at once get a glimpse of the way in which a *viciously* nourished body distorts, intercepts, or perhaps sometimes wholly transmutes, the psychological expression of the human being who lives from choice, accident, or necessity—saddest of all mortal lots—in utter opposition to the cardinal laws which alone produce the *mens sana in corpore sano.* I know that here I touch at once a great mystery and a crucial problem of human life, but I am convinced that in sanatory reform we have one of the surest safeguards against crime and vice. It is satisfactory to know that already many hospitals, including the Calcutta Hospital, have been provided with these filters, and the private residences of the Queen have been fitted with them. That the extension has not been general throughout the military and civil services reflects on the Government. Every public institution, every workhouse in the kingdom, should be provided with the water-purifying apparatus; and, in face of the coming sanatory legislation, it would not be, I think, amiss to take a leaf out of Mr. Forster's educational book, and render it as compulsory on builders to put filters in the cisterns they build as we have long made it compulsory to build party walls of a sufficient thickness to defy fire. When we are more civilized no doubt we shall take some such steps in beneficent legislation.

TEA.

BEFORE treating particularly of this naturally very interesting subject itself, it will not be out of place to note a few extraordinary Chinese oddities, which I find amusingly given in the following extract from a work published at Macao:—

"On inquiring of the boatmen in which direction Macao lay, I was answered in the west-north, the wind, as I was informed, being east-south. We do not say so in Europe, thought I; but imagine my surprise, when in explaining the utility of the compass, the boatman added, that the needle pointed to the south! Wishing to change the subject, I remarked that I concluded he was about to proceed to some high festival, or merry making, as his dress was completely white. He told me, with a look of much dejection, that his only brother had died a week before, and that he was in the deepest mourning for him. On landing, the first object that attracted my notice was a military mandarin, who wore an embroidered petticoat, with a string of beads round his neck, and who, besides, carried a fan; it was with some dismay I observed him mount on the right side of his horse. On my way to the house my attention was drawn to several old Chinese, standing on stilts, some of whom had grey beards, and nearly all of them huge goggling spectacles; they were delightedly employed in flying paper kites, while a group of boys were gravely looking on, and regarding the innocent occupation of their seniors with the most serious and gratified attention.

Desirous to see the literature of so curious a people, I looked in at a book store. The proprietor told me that the language had no alphabet, and I was somewhat astonished, on his opening a Chinese volume, to find him begin at what I had all my life previously considered the end of the book. He read the date of the publication—'The fifth year, tenth month, twenty-third day.' 'We arrange our dates differently,' I observed; and begged that he would speak of their ceremonials. He commenced by saying, 'When you receive a distinguished guest do not fail to place him on your left hand, for that is the seat of honour; and be cautious not to uncover the head, as it would be an unbecoming act of familiarity.' Hardly prepared for this blow to my established notions, I requested he would discourse of their philosophy. He reopened the volume and read with becoming gravity, 'The most learned men are decidedly of opinion that the seat of human understanding is the stomach!' On arriving at my quarters, I thought that a cup of 'Young Hyson' would prove refreshing, feeling certain that in this at least, I should meet with nothing to surprise me; imagine my astonishment when I observed that the 'favourite leaf' the Chinaman was about to infuse, looked different from any I had ever seen, it being, in colour, a dull olive, having none of the usual bloom on its surface. I remarked on its appearance, when my attendant quietly said, 'We never use painted tea ourselves, but as the foreign merchants will pay a better price for it when the brown leaves are made of one uniform colour, we of course have no objection to cover them with powders, especially as it makes the common withered look like the best tea.' On drinking the infusion made from the pure uncoloured leaf, I at once resolved to become a convert to this fashion, leaving the other Chinese customs for future consideration."

On the British Empire the sun never sets, equally true is it that throughout the whole world, the prevailing beverage most prized, and grateful to the constitutions of all races is tea; as to the peculiar or specific benefit derived from the use of this vegetable drink, doctors and all theory upon such a subject is best cast aside, for the more self-satisfying practical fact that 500,000,000 of human beings feel its want, and are gratified by its use. The leaf of this simple shrub, a native of that vast region China, has unostentatiously introduced itself in the country of India, Tartary, Thibet, Siberia, Russia, Central America, South and North America,

Australia, Europe, and last, but not least, England, for we, as a nation, are, next to the Chinese, the greatest tea-drinkers on the face of the globe; our ever varying climate, the sober regular habits of the female portion of society; and above all, the exhilirating and invigorating effects produced by its use, renders tea acceptable to rich and poor, old and young, the lord and the peasant.

That tea, when pure, is nutritious and a true aliment, has been shown by the researches of Liebig, the celebrated German chemist.

From the cottage to the palace tea has, for many generations past, been held supreme as a beverage and when *pure*, all agree that, by the consumption of a certain quantity of tea, the health and strength of the body is maintained in an equal degree upon a smaller supply of ordinary food. "Tea," we are told in an admirable work entitled the "Chemistry of Common Life," "saves food—stands to a certain extent in the place of food—while at the same time it soothes the body and enlivens the mind. In the life of most persons a period arrives when the stomach no long er digests enough of the ordinary elements of food, to make up for the natural daily waste of the bodily substan ce. At this period tea comes in to arrest the waste, and enable the less energetic powers of digestion still to supply as much as is needed to repair the wear and tear of the solid tissues; no wonder, therefore, that tea should be a favourite, on the one hand, with the poor, whose supplies of substantial food are scanty—and on the other, with the aged and infirm, especially of the feebler sex, whose powers of digestion have begun to fail."

Referring also to the physiological effects of tea, the *Lancet* says, that tea has an influence over the tissues of the body is now among the things admitted in physiology. This influence is of a conservative nature, and its value to the poor can scarcely be overrated. To them, tea is virtually tissue, and makes a supply of food, that would otherwise be inadequate to maintain the weight of the body, sufficient for that purpose. Doubtless an unlimited supply of food capable of replacing any amount of effete tissue would be preferable to a substance which simply goes to prevent tissue from becoming effete; but this is impracticable—the unlimited supply of nitrogenous food being a thing that as yet neither Providence nor politicians have given to us. This preservative power of tea over the tissues

has not hitherto been explained. Perhaps it may not be altogether unconnected with another influence of tea which we proceed to notice—namely, an influence over the temper or rather the mood, or, speaking physically after our fashion, over the nerves. Nothing, I am sure, affects the wear of tissue more than mood of mind; and tea has a strange influence over mood—a subtle power of changing the look of things, and changing it for the better; so that we can believe, and hope, and do, under the influence of tea, what we should otherwise give up in discouragement or despair—feelings under the influence of which tissues wear rapidly. In the language of the poor, who in London, spend often an eighth of their income, in buying tea, it produces a feeling of comfort. Neither the philosopher nor the philanthropist will despise this property of tea, this power of conferring comfort or removing *ennui*, of promoting those happier feelings of our nature under which we can do most and bear most.

The eminent Dr. Scoffern in his "Treatise on Food," writes:—"I am very partial to tea, I have taken it as long as I can remember without the usual additions of milk, and sugar, in consequence of this my palate is the more critical in respect to the infusion. The best tea I can find is that imported by the Messrs. Horniman; its natural appearance manifests it to be what it professes, tea that has not been subjected to outward colouring,—a manifestation which its delicious flavour fully confirms."

In connection with this highly interesting and instructive subject, a letter appeared in the *Times* (Jan. 7, 1874), which sets forth some wholesome truths about tea as generally sold. I give it *in extenso*, as it is important to all consumers of tea. And it was read with avidity, as it told everybody about tea as it was and unhappily perhaps is. The letter is as follows:—

SIR,—A short time since you did me the honour to notice a report of mine on the adulteration of Caper, a scented black tea, much used in the northern counties of England. I have since made some further analyses of tea, the results of which I beg permission to make known through the medium of the *Times*.

Some samples of Orange Pekoe examined were all found to be faced or coated with black lead, and one of them was adulterated with lie tea, sand, and magnetic oxide of iron. A sample of "siftings" contained much silica

or sand, and there were separated from it by means of the magnet no less than 8·80 per cent. of the magnetic oxide.

Of eighteen samples of green tea, chiefly Gunpowder, representing, like the Capers previously reported upon, large bulks or consignments of tea, mostly from different ships, all were found to be adulterated as were the Capers. In the first place they were all artificially coloured or faced, sixteen with Prussian blue, turmeric, and a white mineral powder, the other two with the Prussian blue and the white powder only; in the second place, sixteen of the eighteen samples were further adulterated with variable and often large quantities of "lie tea" sand, stony particles, and magnetic oxide of iron.

Of "lie tea" present in so many of the samples the following definition may be given. It is a specially fabricated article, consisting of tea dust or the dust of leaves not tea, sand, stony particles, and often magnetic iron, mixed up into little masses or pellets by means of some adhesive material, usually starch, and finally faced to imitate Caper and Gunpowder teas. The substances used in facing of tea, I find add from one to three per cent. to its weight: these serve no useful purposes whatever, but help to conceal and render practicable certain other more serious and extensive adulterations of tea.

It is evident, therefore, that the practice of adulterating green tea, and this in a very scandalous manner, widely prevails.

As was the case with the Caper teas, the green teas now examined came for the most part from Canton, that place being the great centre of the adulteration of tea, a fact perfectly well known to merchants, brokers, and wholesale and retailer dealers. Those importers, therefore, who buy these adulterated teas of the Chinese are not in any way imposed upon, but are fully aware that the teas in question, as shown both by their appearance and the prices at which they are sold, are adulterated.

I have the honour to remain, your obedient servant,

ARTHUR HILL HASSALL, M.D.

The same famous authority, a short time subsequent to the publication of the above result of his investigations of tea as ordinarily consumed, wrote as follows:—

"London, 19th February, 1874.

"At the Dock warehouses, where teas imported by Messrs.

Horniman are in Bond, I have taken samples from original chests of black and green teas, which I have microscopically and chemically examined, and found perfectly pure, and free from the usual artificial facing: the quality being equally satisfactory.

"I visited the town warehouses of Messrs. Horniman in Wormwood Street, City, and took samples of their teas ready for consignment to their Agents, and on a careful microscopical and chemical analysis, I find them to be perfectly pure, and of superior quality, and free from the facing generally found on tea ordinarily sold.

"I have purchased packets from some of the Agents for 'Horniman's tea,' the contents of which I find, on analysis, to correspond as regards purity and excellence of quality, with those teas obtained from the Docks, and from Messrs. Horniman's wholesale warehouses in London.

"ARTHUR HILL HASSALL, M.D.,
"Author of 'Food Adulterations Detected,' &c."

In 1854, a more full report on Horniman's tea was made by Dr. Hassall; he found then as he does now, both the black and green teas to be perfectly pure, and concludes his report with this remark:—"These investigations enable me confidently to assume that the consumers of tea, now having fairly the choice of both the sophisticated and the pure, will not be slow in choosing between the wholesome natural kinds and those which are 'got up' for appearance and in order to realize higher prices through their defects being hidden or glazed over with the powdered colours employed."

The immense sale (over five million packets every year) proves that the public have been as discerning as the learned Doctor anticipated, and there is no doubt that tea will in future be preferred absolutely pure. Consumers evince a growing desire for Horniman's packet tea, because it is guaranteed by the importers to be free from all adulteration, especially the pernicious coating of Prussian blue, generally used on the ordinary teas, and they have thus laid the foundation for a universal revolution in the tea trade, and will rapidly bring about that great desideratum of the age we live in,—pure, cheap, and wholesome tea, grateful to the palate, and invigorating to the system.

COCOA.

MOST of us are familiar with the well-worn maxim, *Ignorantia non excusat legem;* but Nature is even more inexorable than law, and whoever remains ignorant of any of her necessarily vital truths as regards his own organism inevitably suffers the full penalty prescribed by Nature herself for every violation, whether wilful or unintentional, of her immutable laws. It is happily beginning to be popularly understood that the great percentage of all the miseries of life, and not a small part of its immoralities, great and small, result far more from ignorance than from design. When we consider, in its anatomical and physiological aspect, the complicated nature of the human organism, it becomes indeed a marvel to think how well it works as a general rule, notwithstanding the general gross ignorance that almost everywhere prevails, even among persons of some education, as to the constitution of the human body, its functional aspects, and the manner in which life is sustained by the food we eat.

That the happiest effects would universally spring from a diffusion of even very elementary fact-knowledge on these points is doubtless obvious, and the constant crusade against adulteration maintained by many press organs has certainly effected much good by rendering people generally anxious to apply some other tests to what they eat and drink than the vulgar, superficial, and often seriously-misleading ones of the palate and the purse. Knowledge, however, of this kind, despite its paramount importance, is still but very partially diffused among, and only imperfectly comprehended by, the

great mass of the people. It would, indeed, be, for a time at least, practically sufficient, perhaps, were the chief staples of our ordinary diet generally and accurately understood in their several capacities as agents for forming bone, muscle, fat, blood, brain tissue, and above all, as maintaining that practical synonym for life—heat. Foremost among food-staples stands cocoa, although perhaps it is only of comparatively recent date as an article of really popular use.

The plant from which cocoa is obtained was named by Linnæus, the great botanist, the *Theobroma Cacao*, and must not be confounded with the *Cocos nucifera* (the cocoa-nut tree), which may be almost said to epitomize human life and human industry. Furnishing at once beverage and food, timber for the domestic dwelling, and a roof in its foliage, oil for lights and domestic use generally, a strong cordage of its fibre as well as fabrics for household use, with vessels ready made in its hard shells, no wonder the indolent savage regards the tree as a heaven-bestowed bounty on his idleness. Indeed we are told on indisputable authority that in some parts of the tropical world the fiftieth share of a large tree will comprise the heritable estate of a son, and the possession of a whole grove of these wealth-producing trees constitutes a princely fortune.

In popular language, the human organism has often been compared to a fire which must be constantly fed with suitable fuel in order to maintain its action. Roughly, the uses of food are two—the former is to create blood, flesh, and bone; and the latter is to sustain the necessary animal heat. We may divide these into two groups—flesh-formers and heat-givers. The human body, resolved into its gaseous elements, is composed of carbon, hydrogen, oxygen, and nitrogen; the three former arising from the starch, gum, fat, and sugar, in the food we eat, viz., heat-givers; and the last from the fibrin, albumen, and gluten, viz., flesh-formers. The average daily consumption required by man is of carbon 4,500 grains; nitrogen, 300 grains. Now, it is impossible to build up a solid mass of healthy tissues unless the necessary amount of animal heat can be maintained by the addition of heat-givers, as otherwise the results of the flesh-formers will be burned away and expired in carbonic acid gas as soon as they are achieved. Of two kinds of food, for example, equally nutritious as flesh-formers, the practical results may widely differ. The one may be taken *cold*, when a part of what would have gone to increase the bodily strength is at

once burned away to keep up the vital heat; while the other substance being taken *warm*, the consumer will probably receive the full benefit of its tissue-forming properties without any subtraction thence to maintain, as in the former case, the normal heat consistent with actual life.

Probably few persons passing the two modest-looking houses which constitute the frontage of the Cocoa Works of Messrs. Dunn & Hewett, in the Pentonville Road, would imagine that within there was an extensive manufactory, containing elaborate machinery, and a large number of hands busy in preparing one of the staples of our breakfast and tea tables.

The cocoanuts first enter this laboratory of food in sacks, and the Iceland moss in huge bales forced into the hardness of hop-pockets by hydraulic pressure. Both have to be well searched for the purpose of rejecting whatever is mouldy or superfluous. The nuts are sorted by girls, who sit at a sort of desk, partly grated; so that a portion of the sorting is self-performed, and the rapidity with which their nimble fingers pick over the rest is astonishing. A few mouldy nuts would spoil perhaps a good many packets, and this initial stage of the manufacture is therefore, as indeed is every other one, very carefully traversed. The sound nuts are afterwards roasted, winnowed, and ground, and at length become ready for direct conversion into food. It would not, however, by any means answer to have cocoa without something to temper its intensely nutritive qualities, facilitate its digestion, and render it the desirable food-beverage we find it to be. The flavour of the crushed nib before it is combined with the necessary constituents of cocoa proper is by no means agreeable, and would be as unsuitable for common use as *theine* or *caffeine* themselves. The agents employed by Messrs. Dunn & Hewett are sugar, arrowroot, and sago. The first substance—the sugar—is an economic addition, rendering the flavour less harsh, and also causing the cocoa to become less soluble, a thing it would never be, in even the cook's sense, unless mixed in proper proportions with some adventitious substances; the second—the arrowroot—has a mechanical advantage, since it renders the cocoa easily powderable, reduces the nutritious properties of the nut to a manageable degree, counteracting the excess of butter existing in the cocoa, and thereby rendering it more easily digestible. As the reader knows, nobody can possibly live on *pure* nourish-

ment, nor even long on a totally unmixed diet, however perfect that diet may be.

Without sugar most probably no one would care to drink cocoa at all, on account of the amount of sweetening that it would then require. To employ, indeed, an homely but opposite illustration, we all know that milk contains every essential to the maintenance of human life; but we know too that no one could possibly live on *butter* alone. When, however, it is brought in combination with bread, what was before simply *nutriment* is transformed into *food*, and will support life and health. In like manner the arrowroot and sugar may be said to convert cocoa, which is almost perfect *nutriment*, into *food*, and thus the parallel in the case of bread and butter is nearly perfect. By an ingenious adaptation of the steam power that grinds the nuts and works the winnowing fans, the superfluous heat is utilized in drying the arrowroot, which is laid on metallic beds. And here I may observe, *en passant*, that the various mechanical manipulations to which the cocoa is subjected create such a pulverous atmosphere that a kind of cocoa "bloom" covers everything, much as I have noticed that of gunpowder in a powder-mill. Even the arrowroot inclosed in the drying-trays was tinted, and it was only on indenting the surface that its natural white became dazzlingly apparent. Throughout these works I can emphatically say, once for all, that a scrupulous cleanliness is observed, and that, therefore, the worst of foreign matter to be met with anywhere is but equivalent to the crumbs left on our dinner-table. In fact, to parody the "Ancient Mariner," I may observe that here at least it is

> Food in its rudiments everywhere,
> Making you feel you could feed on the air.

As soon as the sugar, arrowroot, and cocoa are combined, they are put under the action of a mechanical stirrer, in order to mix them well; and it is here that the most common, reprehensible, and deleterious form of adulteration is practised by the unscrupulous. Against this, indeed, Messrs. Dunn & Hewett have always directed a persistent and powerful opposition. Reference to the different food reports and medical journals, as well as to other sources of dietary information, will elicit abundant proof of this fact. In the first place an inordinate amount of farina is added to the cocoa, until the latter is almost extinguished and becomes so

pale that it is necessary to introduce colouring matter—one crime always leading to another—a species of clay is frequently employed for this nefarious purpose. Then, as the sum of nutritive matter is so materially reduced by reason of the small proportion which the cocoa bears to the other ingredients, it is essential to supply the deficiency in pure cocoa butter with some foreign adipose matter. I fear my readers will be horrified, as I was, when I first heard that the fat of horses is a favourite form of this abominable adulteration, and possibly to some extent a species of judgment on those who *will* prefer cheap rubbish—a far too common feature of household extravagance.

I have already explained how impossible it is to exist on pure nutriment. On this account, the combination of cocoa with the Iceland moss is especially valuable, the latter furnishing a most advantageous medium for facilitating the digestion of the cocoa itself, and deserving in all respects the very high eulogium that Dr. Hassall, the well-known analyst of the famous Lancet Commission, has already passed upon it. There are many specialities in cocoa. Caraccatina is one kind, whence a portion of the actual butter is carefully extracted, an operation, by the way, of an interesting nature, the cocoa itself being placed in a bag and subjected to great pressure until, under its influence and that of heat, the fat is squeezed out in a thick liquid, which is caught in tin vessels underneath. As soon as cool, you find a perfectly hard cake, which represents, indeed, one might almost say, a form of solidified animal life, but which one could no more eat than we could munch up a pound or two of butter. The cocoa remaining after the squeezing operation is a hard mass of brown-looking rough stone, and is then ready for reducing to powder. This excellent preparation is especially suited for the invalid, to whom the ordinary cocoa is too gross a food.

It is exclusively made of the finest Caraccas and Trinidad nuts—and I am fully competent to speak of their first-rate quality, seeing that I crushed some of the nibs, and was so satisfied with their full food-like aroma, that a farther experiment proved that, in default of any other, a dental mill might keep one from starvation wherever such nuts could be found.

Bromatine is similarly deprived of a portion of its superfluous butter, and comprises an excellent *thin* drinking cocoa, a great desideratum for many, who, like ourselves, cannot

take ordinary cocoa in warm weather, from its being, in general, so much more of a food than a beverage.

But it is not only in its solid and most domesticated aspect that cocoa is to be seen here, passing through its various stages as an article of food. In a French room, as it may be termed, I found quite a laboratory of food luxuries, where cocoa of the finest and most nutritious qualities is wrought into various creams and elegant forms of fancy confectionery. Here I saw a flat tray of starch indented at regular intervals with small pits. The maker of the chocolate creams runs a stream from the spout of a can full of cream along these cavities, and as soon as their contents cool sufficiently, they are transferred to girls who coat them in chocolate paste. The former operation is necessarily carried on in a very warm room, and if it is correct to talk of "cutting" a London fog, much more might one speak of devouring such a delicate and sweetmeat-like atmosphere.

Throughout these very interesting works, the most beautiful precision and order reigns supreme, and the admirable way in which the various mechanical appliances employed are utilized, so as to serve and serve well a variety of uses, is reproduced, though in another way, in the manner in which the workpeople themselves have their strength economized, and the full benefit of whatever the very inventive genius of the late Mr. Dunn himself could devise, for their permanent benefit.

MILK.

ONSIDERING that for not so very inconsiderable a fraction of life every one of us is entirely supported by milk, and that during the whole of life milk is present with most people at two meals, its importance as an article of diet has hardly been held of sufficient account. Standing alone as it does, the only food-drink, which in itself, contains every essential to the maintenance of physical life, milk might be justly considered as in some way its representative. Now and then there is a panic among the public respecting this—at once a necessary and a luxury of daily life—and a great deal is said about the importance of obtaining pure milk, but little or nothing is ever accomplished, and the mass of people continue contented with whatever the normally low profits of an intensely competitive trade, urge its members to vend. The mere commonplace of phisiology that, whatever we eat, drink, and for the matter of that, whatever we breathe, necessarily contributes in co-ordinated relations to construct every tissue of the human body, is forgotten or neglected. And yet it can be mathematically ascertained that the physical agencies which undoubtedly determine the organism of every one are not limited in their results to the material; only just as the flaw in the pane of glass falsifies the visual impression, that everything is imperfectly seen through its medium, so is it with a virtually diet-poisoned body. Even moral impressions must be received by some description of

tactical agency, and certainly the purer these parts are the truer must necessarily be the ideas transmitted by them to our self-consciousness. There is in this a perfect analogy with the corresponding necessity under which every man of science labours, to have the instruments he uses absolutely perfect. In the present instance I must confine myself to milk only, and although, after infancy, the quantity individually taken seems but the merest modicum in many cases, it must be remembered that the aggregate quantity generally consumed in the course of a year is considerable, while the nature of the article is such, that its purity or impurity never fails to exercise a more or less radical effect on every constitution. Few persons, when milk is mentioned in its industrial and hygienic aspect, remember that natural product, as it is, there is much to consider besides the cow and the milk-pail. The beginning of that we all consider an essential to the comfort of, at least, the tea and breakfast tables, is, after all, in the simple blade of grass, and even that cannot be properly produced without the labour of previous cultivation. The land has to be prepared, the seed sown, the crops carried, the calves carefully reared, and a succession of young ones provided for before a continuous supply of new milk can be obtained. A gallon of milk, which can be sold for only a few pence, may have to be distributed among as many as twenty houses, so that it is obvious that under nó circumstances can the industrial production of milk be in any degree so profitable as is that of any other article of common consumption. Good dairy farming, the rich land, healthy and vigorous cows, a quick and regular transit to market, and perfectly honest vending to the consumer, are indispensable conditions to the having in every house the modicum of pure milk, which is so necessary a complement to our daily food. This being the state of the case, it is far more regrettable and culpable than surprising, to find that hitherto milk, as a rule, has been everything rather than what it is supposed to be. It must have always been evident that as the profits were relatively to every other department of food-purveying almost insignificant, and as those profits were not susceptible of being increased, the only remedy for the extensive adulteration which had so long been practised, would be found in those natural advantages which co-operative enterprise always possesses over the commercial effort of the individual. It is evident that an organization on a large scale, provided with abundant capital, the necessary

appliances for the distribution of milk over a practically unlimited area, together with a well-trained staff of efficient well-disciplined assistants, could, by obtaining milk supplies from healthy cows in healthy localities, serve the public incomparably better than could be done by any other means. It must be remembered that the adulteration of milk does not necessarily take place at some point between the cow and the consumer; milk may be most effectually watered in the cow itself; bad pasturage and diseased stock may, and often are, answerable for graver evils. There is not only dishonesty but ignorance to dread in the purveyors of our milk. It is now about nine years since the Express Country Milk Company, Limited, was established for the purpose of supplying the metropolis with really pure country milk, obtained from the best dairies in England, and conveyed to town by express train. Few persons unfamiliar with the details involved in such an undertaking are probably aware of the scale on which such an enterprise had to be conducted. In order to keep a thousand cows in full milk it is requisite to have altogether 2,400 head of stock, and the amount of labour and care thus involved is obvious. The company possess at College Farm near Finchley, about a hundred and fifty acres of rich meadow land, admirably adapted for producing the richest and purest milk, while by special arrangements large additional supplies are obtained from Blenheim Park, the Oxfordshire estate of the Duke of Marlborough, from Sherburn Park, belonging to the Earl of Macclesfield in the same county, from Lord Monson's at Reigate, and also from Knebworth Park, the well-known seat of the lamented Lord Lytton. At the farms and in the metropolis the most scrupulous precautions are adopted to insure that the milk be not only pure but cleanly purveyed. Some notion of the "plant" required and the laborious detail involved from the transit only, may be formed from the fact, that for each churn that travels down by rail to the dairy farm by "empties," have to be employed for the milking being performed twice daily, and the company's arrangement for cleaning the churns being most elaborate, the empty churns can only be properly prepared by having a reserve of three for every one at work. Those who are familiar with the method employed in every well-ordered brewer's cooperage for cleansing casks will, perhaps, be glad to know that the churns are thoroughly scalded in a similar way after each time of usage. When it is remembered how

rapidly milk becomes sour, the importance of avoiding even the possibility of foul churns being used for fresh milk will be fully appreciated. At the head London office, situated in Museum Street, the process of churn cleaning may be seen in operation, while the general arrangements of the central depôt are well worthy the careful attention of all who care to have wholesome, nutritious milk. The success of this enterprise may be best inferred by its growth. Although at its commencement its operations were designed simply for the benefit of its original promoters and other immediate friends, the annual sale has steadily increased until it has now reached the very great total of upwards of three millions four hundred and forty-seven thousand quarts, or 3,847 tons. It is only just to the company to add that this remarkable development has not in any way been aided by the favourite and most approved motive power of contemporary enterprise —of persistent advertising. In 1866 at a meeting of the Poor Law Guardians for Marylebone, Mr. J. Randall, the medical officer, reported that the milk of this company had been found by analysis to be good and pure. This is only an instance of many similar testimonies to the company's honesty, forthcoming then and since. It is, however, very noticeable, that when Dr. Letheby and Professor Wanklyn were ordered by the President of the Local Government Board to sample and test the milk supplied to the metropolitan workhouses to the number of ninety-eight, the only unions where the milk was found in every case genuine were those served by the Express Country Milk Company, these being the Shoreditch, Strand, and St. George's Unions. Although it does not exactly belong to my present subject, I think it right to mention, by the way, that although, on this occasion, it was incontestably shown that some of the unions were supplied with bad milk, that milk is still served them. Such is the practical value of even the most elaborated endeavours to ameliorate the forlorn condition of that object of universal pity, but universal neglect—the English pauper. Those who have ever been intimate with the every-day details incidental to the dairy and the milk-walk, know that bad pasturage, diseased cows, and adulteration do not comprise all that a milk consumer has to dread. The evils to which I allude will be at once apparent when I mention some of the company's bye-laws. In the code of rules drawn up for the observance of the numerous

employés of the company, it is expressly provided that, in addition to being sober, punctual, clean, and civil, the men shall, under no pretence whatever, use in any form, while on duty, either tobacco or snuff. The company's system, indeed, so far as its staff goes is quite regimental. The most perfect discipline and method are strictly observed, and as a further precaution against a subtle but in ordinary dairies not unusual form of transmitting infectious diseases, the greatest care is taken that no man shall be at work while suffering from any description of illness. Although the milkmen's labours unavoidably begin at a very early hour, their lot, at least, when serving this company, is by no means a hard one, more especially as after six months' service they all become entitled to the benefit of a substantial sick fund. I think, then, that every milk consumer—that is practically the whole community—must agree that it would be a substantial benefit to all were every municipal milk supply regulated on the same admirable plan as that so successfully inaugurated, and so satisfactorily worked out by the Express Country Milk Company.

MEAT PRESERVING.

I SUPPOSE that at some time or other all my readers have noticed the peculiar effect on objects seen through a flawed pane of glass. Chimneys remaining entire in utter defiance of the laws of gravitation, vistas reducing all the canons of school perspective to absurdity; and a general contradiction of common sense is the result of a bubble or two in a few square inches of glass. Now this may be in itself a very trivial matter; but I have never myself experienced the innocent delusion in question without reflecting on the probability that corresponding flaws must often exist in the bodies through which only we receive impressions from without, and through which only we can manifest ourselves from within. But the worst of it is that, in the case of the human flaws there is, so to speak, no certainty that we shall even know of their existence, and thus be enabled to modify correctly the false ideas given and communicated through defective agencies. Now all this results directly from the kind of food we eat; and surely there is nothing that yields in importance to a correct and practical knowledge of at least our food staples or the manner in which they perform their respective parts in the human economy. Meat and bread are, so to speak, the timber and masonry of the human organism; and if either are seriously deficient in any essential quality we may be quite sure that vicious results in the structure they help to create will follow. Notwithstanding the fact that so many millions of men live on grain of various kinds, there can be no doubt that meat is the proper food for man; and it were historically simple enough to show that the meat

eaters have in all cases subjugated and outstripped in all respects—moral and material—the grain eaters. One pound of rump-steak, as most of my readers know, is more nutritious than three pounds of wheaten bread: while I find that in 100 parts the analysis of even lean beef as compared with wheaten bread is as follows:—

Lean Beef.		Wheaten Bread.	
Water and Blood	78	Water.	45
Fibrine	19	Gluten	6
Fat	3	Fat	1
		Starch	48
	100		100

The fibrine in meat exactly corresponds with gluten in bread.

At a time like the present, when it would almost seem as though the coal-merchant and the butcher were become the arbiters of our destinies, I felt a peculiar interest in embracing a recent opportunity for including in the more dietetic section of my notes on Food-Industries the extensive Meat Preserving Works and Food Stores of Messrs. John McCall & Son, in Houndsditch.

Having heard something about the elaborate processes for defying decay and keeping meat fresh any length of time, I went, big with chemical expectation. I have, indeed, always thought the transition of chemistry from an occult science to a most prominent and productive factor in the ordinary economy of our domestic life is surely one of the greatest triumphs of civilization. It is not, indeed, that the progress is so much manifest in the individual case of even a Liebig, as in the fact that thousands of persons engaged in the most familiar pursuits of the kitchen now perform a variety of processes with an unconscious and even involuntary scientific skill which simply arises from the happy circumstance that many of the fundamental truths of the profoundest chemistry are now mere matters of general information.

Houndsditch is certainly not to a superficial observer one of the most sightly thoroughfares in London. I had formed some notion of what Mr. McCall's premises might be, but it was more in connection with a vast depôt for Australian meat than for anything else. Passing under the gateway, which forms comparatively an obscure entrance into the

works, you find yourself in an immense courtyard crowded with packing cases and all the usual *disjecta membra* of a great export business.

To begin at the beginning, roughly speaking, two human conditions are primarily necessary in order to make preserved meats and vegetables. These are tinmen and butchers. All the tins used by the firm are made on the premises by a number of whitesmiths permanently employed for that purpose alone. In a long range of lofty rooms you see a vista of benches where the men are busy plying a series of powerful and ingeniously labour-saving presses, each of which strikes out the round bottom of the tin, any size that may be desired, at a single blow. There are also equally ingenious machines, consisting of several rollers, working against each other so as to be adjusted to any measure for rolling out the sides of the tins to the shape required by the men whose duty it is to solder the several parts together. Indeed, there is a long room, fit to dine a regiment in, where you see a series of small hand-furnaces, each appertaining to the smith whose sole business it is to properly solder together the seams in the tins. Traversing these rooms with their immense piles of glittering tin in all the stages of domestic development, from the simple sheet to the finished receptacle for boiled beef and carrots, and afterwards visiting the storage department, where you see solid blocks of tin like the stout pillars in the Nineveh Court at the Crystal Palace, some adequate idea of the magnitude of the operations conducted here may perhaps be formed. You might, indeed, fancy that half the retail tinmen of the kingdom were to be supplied from these piles of polished tins; and yet all this is but an incident in the works.

Below, there are two great departments, divided by a partition. In the one, the butchers' work and the actual filling of the tins is accomplished; in the other, the cooking process is completed. There are in the former room a great number of benches, at which you see a crowd of men and women eagerly employed jointing, cutting up, and generally preparing every kind of flesh, fish, and fowl imaginable. You here stand on wooden gratings, placed above a stone floor, intersected with channels down which water continually flows—an admirable means for washing away all impurities and blood stains resulting from such a concentration of butchers' shops, under pressure equal to that of a fine

Saturday night at Christmas time in an operative neighbourhood after a successful strike. I was pleased to see how, in spite of the energy with which each was working, the most scrupulous attention was paid to the preparation of the various kinds of meat before any was placed in the tin, where it might perhaps have to remain for years. There were no rough, unsightly, coarse pieces stuffed in at the bottom; and the perfect discipline here existing under an excellent foreman system seemed to have made it habitual with every person engaged in these operations to do his or her task with the greatest precision and dispatch.

The turtles struck me very much, lying about shell-less in all their clumsy bulk. The green fat which is to many the very poetry, not to say pastoral, of dining, which is perhaps to appear hereafter at many a state banquet, is to be seen neatly packed into small tins, similar to those in which some of us get our condensed milk. This is rather a costly article —I mean the turtle fat, seeing that the tins are worth about half a sovereign each. So rapidly is the work performed here by numbers and discipline, that, almost while you turn your head, a great expanse of table, clear the moment before, will be covered with quite a cloud of fowls.

In other parts are women busy in carefully washing the tins out, a satisfactory sight to me, and one which would doubtless to many among us be a welcome sight, considering what we have heard in some quarters respecting strange uncouth things occasionally found in the tins containing preserved meats.

I saw here a specimen of some carrots which had been taken from a tin where they had been inclosed for many months, and certainly they looked much more as though they had been lately dug out of the ground.

There are also the ranges of boilers for making soups, and the bone digesters, which could soften into gelatine the bones of the most monstrous mammoth as easily as you can soak your biscuit in your wine.

But my great curiosity, of course, was to inspect the actual cooking process whereby time and decay are set at defiance, and the food is embalmed, as it were, with a skill which may some day prove of the most essential service to mankind in more populous periods yet to come.

There is besides another feature about the cooking pro-

cess, which will probably interest my readers as much as it did me. In seeing how English flesh, fish, and fowl are here cooked, you see also how the Australian meat imported by Mr. McCall is cooked at Melbourne. I know from personal experience that many persons would take much more kindly to the very economical mutton and beef of our antipodes could they only know how it *really* is cooked; and for such persons it may be satisfactory to hear how the Melbourne Meat Company proceed—their culinary operations being identical with those conducted at the works in Houndsditch.

In a very large room, with a singularly lofty ceiling and excellent light, are twelve great shallow baths. The true bottom of each is covered with a worm connected with the boilers in the adjoining department and supplied by steam in such a manner as to effectually boil the comparatively thin slice of water above. Over the worm is an iron grating, which affords an even and stable stand for the tins which, when placed upright thereon, rise a few inches above the surface. Each bath accommodates something like one hundred large tins, and as twelve hundred can be properly cooked in five hours, and as the cooking at that rate has occasionally gone on for a day or two, some notion of the quantity of food turned out ready for use this year or the next, may be formed.

So far all seems simple. The steam is let into the worm, the water in the bath boiled indirectly, and the cooking thence completed. This would not do. So intense a degree of heat is required to cook the meat properly, that the steam arising thence would render it impossible for any human being to approach the place; and the problem to be solved was how to procure the requisite temperature in the most convenient and economic way; for, of course, the waste of heat in ordinary open boiling would be excessive, while the want of concentration around the tins would have rendered the cooking ineffective.

At last it was remembered that fat does not boil at a temperature that throws water into the intensest ebullition; and accordingly it was decided to boil the tins in muriate of lime and cover the surface of the water with a layer of fat. The plan proved effectual. While the water itself boils fiercely, you can touch the fat on the top with impunity, and the tops of the tins can be seen, there being scarcely any steam at all, except a few small periodic puffs where the coating of fat

may have grown defective. When the cooking process has gone on a certain time, the little orifice left in the top of the tin is closed with a drop of solder dexterously applied, and wiped with a wet sponge. By these means all the air is expelled, and the whole hermetically sealed. When the cooking is considered complete, the tins are withdrawn and painted, the object of the painting being to prevent the tin from contracting any rust.

Such is the process, admirable alike for its simplicity, precision, and cleanliness. Bearing in mind how very serious is the loss on meat cooked in the usual way, not to mention the butchers' heavy charge for bones, fat, and other waste, it would certainly seem as though preserved meats were destined to have a great domestic future in this country.

I observe that already prejudice has so far been subdued, that nearly forty prisons, lunatic asylums, and charitable homes in the United Kingdom have availed themselves of Mr. McCall's preserved meats, and in every case with the most decided hygienic and economic advantages.

COOKING BY GAS.

MID the multitude of social questions of the day which press for immediate solution, there are none more individually important to each one of us than the two pressing problems of household fuel and domestic labour. There is no prospect whatever that coals will ever again be really cheap at home; and while, on the one hand, the Agents-General use every means to attract the respectable and industrious classes of domestic servants to the Colonies, whence they never return; and, on the other hand, School Board education and hosts of manufacturers daily diminish the ranks of this class, there is no probability of our ever having again a reasonable supply of good domestic servants. For every evil there is, or may be, a remedy, and it would seem that, to a great extent, society will find an ample compensation for the dearness of coals and the dearth of servants in the comprehensive application of gas to most of the requirements of household life. Certainly, to be able to convey a full-sized bath, furnace, boiler, and all, as easily from one house to another as a piano; to bake one's loaf or tart in the sitting-room, if need be; to deprive "washing day" of more than half its normal horrors—in a word, to have all the advantages of fuel without any of the trouble, discomfort, waste, litter, or extravagance inseparable from the use of coals or coke, is no mean achievement in what may be termed domestic engineering. A visit to the works of Mr. Shrewsbury, at East Brixton, will convince anyone how little necessary it is that most of the operations of the household connected with the

laundry or the table, should be, as they generally are, dirty, troublesome, anything but economic, and, in almost all cases, too "menial" in detail for the members of the family themselves to engage in. It only needs, indeed, a ramble through Mr. Shrewsbury's extensive workshops, where almost every essential to domestic life that implies fire as its necessary basis, is manufactured, to perceive that, after all, it really is quite practicable to render even cooking and washing, nearly, if not quite, as neat and agreeable in their mere details as are the ordinary leisure labour of a lady who devotes her spare hours to useful and elegant home industries. And all this is wrought simply through ingenious mechanical invention, aided by what is no doubt bound to effect a very great economic revolution at home among ourselves, namely, the more general application of gas to our domestic wants. Here, indeed, in Mr. Shrewsbury's very interesting factory you may see, so to speak, the dirty and rough work of household life done once for all, if you will, in the actual making of the many ingenious contrivances for saving labour or performing it under the most agreeable conditions as to personal cleanliness and freedom from fatigue. There is, indeed, the great advantage of inventions of this kind, as all excessive labour is anticipated and actually accomplished by the manufacturer. One of the first articles that will naturally arrest notice is Mr. Shrewsbury's very admirable "Nonpariel" portable gas oven, which has, however, no gas inside. The advantages of gas for culinary purposes are, I should think, obvious. It has been found that when meat has been roasted or baked over gas fumes the flavour has been spoiled, and the very pores of the meat practically poisoned. Mr. Shrewsbury's gas oven is so constructed that the articles cooked do not come in contact with the gas itself. The ovens are heated externally from under the iron floor by means of a swivel burner, which swings in and out as a trivet weight, and permits the cooking of potatoes, &c., in a compartment below by means of the reflected heat. An equable temperature is always maintained, as the burnt air finds a vent at the top which may be used, by the bye, as a hot bath. There is a water dripping-pan which keeps the fat from reaching the sides of the oven, the dripping from being burned and wasted, and by generating steam preserves the moisture inside, so that while the meat is cooking it is not burned away, as in open fire roasting. These ovens are compact and portable, cost in use, perhaps, a penny an

hour, and form, in reality, quite a cabinet kitchen. Then there is a gas broiler; this is a very useful article for summer, the gas being at the top and the gridiron below; the cooking is again by reflected heat, so that the burning gas cannot possibly impregnate what is being broiled underneath. These are made of various sizes suitable for cocking one or two chops, or large enough to cook a joint of 18 lb. or 20 lb. weight, while the top forms an excellent hot plate for boiling from one to six saucepans, and the larger sizes are fitted with a pastry oven as well as the broiler for joints, poultry, &c. There is a small boiling apparatus, which may stand on the table, as it is made ornamentally for that purpose; and will cook to a considerable extent without emitting smoke or creating the least smell. A tea-urn and a nursery or tea-boiler consist of two cylindrical vessels with compartment beneath, in and out of which swings the swivel-like gas-burners, which, when lighted, shut in quite closely, so that nothing is seen in the way of fire or smoke. There are also excellent laundry requisites in the shape of a new portable washing copper, which has many advantages over common ones, being very economical, and not needing brick-work or much room; while Mr. Shrewsbury's new registered laundry-stove, a mere iron frame, with perforated bar for gas-jets, heats, at a nominal cost, flat irons, without smoke, smell, or, indeed, any trouble at all. A new tailor's gas-stove has also been constructed so as to shut in the very large irons employed by tailors, while it heats them sufficiently without at all soiling their surface. For the conservatory, instead of the old-fashioned, complicated, and expensive systems of hot-air or hot-water pipes or stoves, Mr. Shrewsbury's Nonpareil gas conservatory boiler, by means of gas-burners at the bottom of a metal cylinder, boils sufficient water to heat several parallel pipes standing like the bars of an empty grate, and radiating warmth as effectually, and much more regularly than could any coal fire. These boilers can be fixed outside a brick wall, and connected with the necessary pipes within, and thus, at a most trifling outlay after the first purchase, almost any desired temperature can be permanently secured, independently of the vicissitudes of the weather. This principle of clean, smokeless, regular, and cheap heating by gas, has been applied to baths also. The gas-burners, swinging in and out into a compartment underneath the bath, which is most strongly constructed with a copper bottom, the hot

air, after traversing the bottom and heating the water, can be made to enter a terra-cotta condenser, where all the moisture is absorbed. There is also, if wanted, a little chamber or hot closet wherein linen, &c., can be warmed. The advantages of heating a bath thus, not only include simplicity and economy, but dispense with smoke, steam, and soot. The baths are fitted with valves for regulating the supply of water, and cannot possibly get out of order. Mr. Shrewsbury also makes what is called a "bath cistern" for supplying about fifteen gallons of boiling water, so that by simply placing one of these over a bath where the bath is already fixed (and no convenience hitherto for heating), a hot bath can be readily obtained without the necessity of pulling the bath, &c., down to fit a gas apparatus to it. One more excellent example of Mr. Shrewsbury's great ingenuity in the successful application of gas to domestic purposes, is well illustrated in his new registered ornamental hot-water coil, which externally resembles a dwarf pillar, and can be placed conveniently in any corner. In the centre, within the coils, is a terra-cotta plug of considerable size, and greatly intensifying the heat produced by the coils. The water in them requires but little gas to heat it; no smoke whatever is emitted, so no flue-pipe is required; while, if required, the hot water may be used for washing. It is evident that this plan of having, in so portable and convenient a compass, all the fire practically that one need have, together with hot water *ad libitum*, is worthy the notice of all in these times of costly coal and troublesome servants. Indeed, to visit this factory is to see how many, if not all, of the most disagreeable details of kitchen-work can be conducted with comparative cleanliness, great speed, perfect efficiency, and an absolute economy that will undoubtedly make these clever inventions of an evidently very able gas engineer most acceptable to at least the majority of the middle-class community.

SODA-WATER MACHINERY.

ONSIDERING how tropical is at times even an English summer, it has ever surprised me that so little preparation is made here for converting to enjoyment and physical benefit what is at present with the great majority a period of exhaustion, suffering, and even sometimes of illness. No doubt what M. Taine would term the inherent immobility of the British disposition accounts somewhat for this; and it might be said without great exaggeration that the normal English man or woman has generally got into a really suitable summer costume by about the time when cold rains and dull grey skies usher in the autumnal close of the year. All this may perhaps seem to some persons a very simple matter; it is not so in reality. What is true respecting costume is equally true respecting diet.

I know, from experience, how common it is for people and even those who are well to do to go on during hot weather on nearly the same diet as that of winter. And yet it should be a matter of common information that with every considerable change of temperature there should be a corresponding alteration in the diet; and were this only always done we should have much less disease directly traceable to the malign influence of sultry days.

At any rate, these reflections were suggested by a visit I paid to the works of Messrs. S. Barnett & Foster's, of Forston-street, Hoxton, London. Most persons know that the machinery for making effervescent beverages comprises a gas generator, condensor, and bottling apparatus. The generator is a vessel with an opening for admitting whiting,

and a crooked, wide-mouthed pipe, through which is slowly poured the sulphuric acid, which, combining with the whiting, produces the required gas. Next is the gasometer, a copper vessel with a dome top inserted in water, and so adjusted that as the gasometer rises a weight regulates its ascension and prevents its rising too high. The gas is then pumped into the condenser on one side, while from the other the soda-water—if that be the beverage making—is also drawn in; thus the two—the gas and the water—may be simultaneously discharged at a pressure determined by a gauge into the bottle. In Messrs. Barnett & Foster's factory the machinery for making aërated waters of every description appears in every stage, for all the parts are made here and put together with an accuracy resembling first-class watchmaking. The Double Direct Acting Soda-water machine is provided with two copper cylinders so as to produce two kinds of aërated waters simultaneously. Nothing can exceed the ease and simplicity wherewith this machine works. Although possessing only the wearing parts of one—so far as friction goes—it is equal in its results to three large-sized single machines. It has a massive frame with a wrought-iron double crank for working two direct-acting solid plunger-pumps with drums on cranks for steam power and handles for manual labour, two large tin-lined copper cylinders having flanges, the two being connected together to facilitate their taking apart easily or cleaning or re-tinning. Each has a water-gauge dial indicator and safety-valve. The handle works the machine while the steam-engine is being cleaned or repaired. The agitators are worked by spur wheels driven direct from the crank. Between the large spur wheel on the crank and the wheel on the agitator shaft there is an intermediate wheel, made to shift in and out of gear, so that if only one cylinder be in use the agitator of the other is still, and by disconnecting one pump it remains only a single machine. There are two copper pipes with connection for attachment at top and bottom of cylinder, and an extra pipe from the pump. The object is this—when a large quantity of one kind of water is required, it is desirable to let it be as long as possible under impregnation. By connecting the two pipes of the two pumps to one of the cylinders, and then connecting the two cylinders, but bottling from one cylinder only, the water and gas are pumped into the first cylinder and agitated, and then passed into the second cylinder where it undergoes a similar process; thus before

bottling the aërated water has been subjected to a double impregnation. Such a machine driven by steam or any other power will produce 14,000 bottles of aërated waters in one day. The dial pressure indicator is a great improvement to soda-water machinery. This has the names of all effervescing drinks marked on the face on a graduated scale, so that the bottler knows the exact prsesure at which he is working. As it is very necessary to get not only the right pressure, but to bottle at a uniform pressure, it will be seen that this indicator is extremely valuable. When first introduced Messrs. Barnett & Foster sent them all out on improvement for one year, and not a single indicator was returned. There is, too, a wiring stand. The bottle being placed in a cup is at once pressed up against a steel projector, which separates the wire into two portions, so that the double wire is never fastened over two parts of the cork at once. The foot keeps the bottle up by means of a treadle until the wire is fastened. An iron frame, with two revolving brushes put into motion by means of a treadle, enables two bottles to be perfectly washed at one operation. Messrs. Barnett & Foster's "registered syrup measure tap" is an ingenious contrivance. There is here no waste of syrups, and the contents of the syruping chamber can be easily accommodated to any required degree. The syruping chamber of glass is fixed in front of the cask containing the water, and when the handle is turned up the bottle fills from the cask, being shut off by this action from the syruping chamber, and when the handle is turned down the syrup is added. Speed, cleanliness, and economy are the characteristics of this contrivance. Messrs. Barnett & Foster have invented a crystal plunge with a metal rod in the centre. They also make one cased with silver, infinitely superior to the wretched electro-plated plungers sometimes used. In some cases the whole of the interior surfaces, including the condenser, are covered thickly with silver. It is well known that the great defects in the gas generators have been the want of perfect interblending between the sulphuric acid and the whiting. The mixing fans having a vertical action, the whiting often largely accumulated thereon, and was not sufficiently divided for the acid to act upon it. It thence followed that these accumulations, eventually dripping off when the handle was reversed, came into sudden contact with a large quantity of the acid. The action then being violent instead of gradual, the generator was severely strained. And, if this did not happen, the whiting mixture would be

poured into the gasometer by the discharge pipe, occasioning thence great delay and inconvenience in emptying and refilling the gasometer tub. The acid is also wasted. In Barnett & Foster's improved generator the action is horizontal, the mixing fans thus drive every particle of whiting off the bottom and carry it upward. Thus safety, speed, and economy are secured, where before there was always waste, and sometimes the most serious peril. The old objection to the manufacture of soda-water was the peril that always attended the generation of carbonic acid gas. Messrs. Barnett & Foster have executed a revolution here by providing a shoot for feeding the generator with whiting, of which the bottom part slides into the generator when the cap is removed. And hence, instead of a screwing, a bottling arrangement is adopted and enables the top to be opened immediately. There is also a new acid tap composed of lead, glass, and silver, resisting the acid and lasting any length of time. There is a pan under the generator, and by withdrawing a slide when the top is opened the whole can be cleared effectually. Thanks to the working economy of these contrivances it is easy to change the generator in one's ordinary clothes without any fear of damage. The aërating machine for champagne, &c., has a strong air-pump to draw gas from the gasometer and force it into the cylinder—a copper vessel silver-lined; this is in two halves, so as to facilitate cleaning, and is bottled together through strong gun-metal flanges. The stuffing boxes at each extremity are so constructed that the greater the pressure the less chance will there be of any leakage. The mechanism consists of a large and strong copper cylinder, with agitator mounted on an iron stand, the gas pump in strong iron framing, with fly-wheel and handles. There is, of course, a corking apparatus to this, and the whole can turn out forty dozen quart bottles a day. Coming to bottling, all know the trouble usual on opening aërated waters, especially if strong. Then there is the chance of corks being bad and the wires are often rusty. Now, Codd's patent soda-water bottle dispenses with cork and wire, saves all trouble, prevents waste, insures the most perfect cleanliness, and may be opened by the most timid invalid with absolute ease. Between the shoulder and neck of the bottle is an enlargement wherein lies loosely a glass ball. Under the top of the neck is an internal groove holding an india-rubber ring. Now, when filled, the strong upward pressure of the carbonic acid gas presses the loose ball hard against

this elastic medium, and closes the bottle effectually. By simple pressure with the finger the bottle may be opened, there is a slight sound but no waste, and the bottle, too, is opened without being—as aërated waters often are—heated by the long-continued pressure of the straining hand. The important points in this invention may be summed up thus:—The ball cannot come out, even on removal of the elastic ring. Thus, not only are accidents by the violent shooting out of the stopper prevented, but the bottle and stopper remain quite perfect for future use. Then, too, the elastic ring being in the bottle and not *on* the stopper, as soon as the ball is freed from its seating by pressure, the tendency of the internal pressure is to clear the ball from its seating, thus facilitating the opening. The liquid also retains the gas far longer. The manufacture itself of these bottles is ingenious; a special tool has been designed for the purpose of cutting the groove to contain the elastic ring in the glass while in a plastic state. The advantages are valuable as obvious. Corks, strings, and wires are wholly dispensed with, skilled labour is not needed, and unless actually broken the bottles are everlasting, while as they cannot be used for any other purpose than that for which they are designed, there is far less difficulty in cleaning them thoroughly. In fact, a manufacturer of aërated water once well stocked with Codd's bottles will find that his bottles not only delight his customers, but are to him all profit. A patent opener is made in the form of a lever fixed below the rim of the bottle-neck, and also one consisting of a round piece of box-wood with a projecting knob in the centre to press down the glass stopper—a neat little toy that any lady may hang on her chatelaine. Not only are these bottles invaluable for export from a pecuniary view-point, but they afford during voyages efficient protection against all the ravages of vermin, &c., which often destructively gnaw away the strings and corks of sweet aërated drinks, while the strength cannot evaporate. An illustration of the value of this invention for export purposes is shown by the fact that on September 30, 1872, a case of these bottles filled with seltzer water was exported in the *Highflyer* (Messrs. Green & Co.), *via* the Cape of Good Hope, returning *via* Cape Horn: the case was never opened during this voyage. On return, one bottle was opened at the Custom House and closed again, it was ascertained that the quality of the water was perfectly un-

impaired, and that the bottles were just as firmly closed as when they first entered on this truly extraordinary voyage of thirty thousand miles. One of the many vital advantages resulting from the use of Messrs. Barnett & Foster's machinery is this: no machines generating gas under pressure can make wholesome aërated waters, for unless the newly formed gas be allowed expansion in a bell, it retains to a certainty the acid it is made from; this is sure to destroy the enamel of the teeth of those who drink it, besides acting very injuriously on their general health. Now the aërated waters made by Messrs. Barnett & Foster's machinery contain only gas that has been thoroughly purified, and as a proof of this there is the fact that soda water thus made remains long sparkling after opening, and will eject the cork a dozen times on shaking the bottle. In Australia and New Zealand, where the consumption of aërated waters is becoming enormous, Messrs. Barnett & Foster's machinery is already as extensively as it is favourably known, and nothing but local ignorance of its real worth prevents these perfect machines from superseding every other kind. Hitherto, regarding aërated waters generally, it held that in England the bottle, on the continent the siphon, and in America the fountain principle have severally prevailed. Messrs. Barnett & Foster seem likely to render the siphon and fountain arrangement universal. The siphons come in one casting from a matrix of fine steel ingeniously cut out and made in halves. The handle of the siphon is fastened by a pin, easily withdrawn; two screws, a male and female, go round the neck inside, a slight projection pressing on the elastic medium. The valve is easily detached, and the several parts, being cast altogether in one matrix, not only go together and take apart with perfect ease, but can be repaired with the utmost facility, and in the event of any portion being broken, it may be replaced by another which is sure to correspond perfectly with the missing piece. Before these siphons are sent out they are all subjected to a test pressure of 200 lb.; hence, though bottles sometimes go under the trial, it has become absolutely impossible that any weak bottles can issue from Messrs. Barnett & Foster's works. Whoever, therefore, once invests in one or more of these bottles knows that, unless the bottle is dropped or struck by a hard substance, it must last for ever, and be always of uniform excellence. A marble counter for syrup

fountains, of elegant design, at once solid and graceful, deserves special notice. At each end, within the slabs forming the extremities, are rows of the siphon syrup bottles, which stand in ice, and are therefore kept cold without an admixture of ice to the contents—a thing to be avoided, both because ice is often impure, and also because drinking ice is unwholesome. Bees and wasps, so strongly attracted by syrups in hot weather, cannot possibly enter, as the piston-rod completely closes the bottom, while at the same time by drawing the rod upwards it comes against the lid, lifts that off, and at once empties and entirely exposes the vessel for cleaning, so that to wash one of these syrup glasses is just as simple as to wash an ordinary tumbler. Then the nature of the syrup is clearly seen —as wine in a wine glass—and the exact quantity in each fountain is equally apparent, while in no case does any metal come into contact with the syrups. An ice-box in the centre keeps a supply, and as the ice is wholly external to the syrups, their quality and flavour are wholly unaffected by any defects in the refrigerating medium. Beneath each syrup fountain is a glass with a bent handle, and considering that the whole arrangement is at once practical, pretty, economic, and in purity far beyond anything of the kind yet attempted, there can be no doubt that these excellent syrup fountains will supersede every other description. The whole effect of the coloured syrups, the cool marble, and the no less cool lustre of the silver fittings, give to the counter an artistic finish only needing tropical weather to make its enjoyment intense.

A SCIENTIFIC INSTRUMENT FACTORY.

SOME century since a section of the scientific world devoted itself to the transmutation of metals, the manufacture of artificial gems, the attempt to produce an elixir of life, and various experiments, not at all of a character creditable to humanity, in biology. In reality these studies survive among us in greater force than ever, with one exception, perhaps, that of the attempt to procure an *elixir vitæ*, although even this, in some limited degree, perhaps enters into the dreams of some of our most secret and enthusiastic chemists. As we know such studies are not as yet in any degree popularized, still perhaps general readers may know that one of the stumbling blocks in the audacious path of biologists, like Mr. Herbert Spencer, is the fact that as yet crystals have never been found in direct connection with organic life; thus we have a sharp and unmistakable distinction between the inorganic and organic world of nature. Now, however, if rumour be not false, M. Hermann Karsten asserts that an organic cell may appear after all in an actual crystalline form. It is pretty certain that this "discovery" will turn out on investigation to be a mere assumption, but it serves at least to indicate the earnestness, force, and daring with which modern science is now advancing among us. As yet, however, although the transmutation of metals and the profitable manufacture of diamonds and rubies still remain but the fancies of Science in its more romantic forms, it is not too much to say that the dream of those who watched themselves hoary over the crucible

whence the *elixir vitæ* was to come, is now in part at least realized. Startling as such an assertion may seem at first, it is but a matter of the most commonplace observation. Every advance in knowledge that lucidly condenses the past, explains the present, and anticipates the future, every abridgment of time and space in travelling, every manufacture that links more closely together the uttermost corners of the earth, every discovery that adds to the existing stock of man's material wealth, necessarily lengthens his life—although the hour-glass measure remains unaltered. And this benign principle which happily animates as a main-spring all human progress, is by no means confined to the rich or the elevated in earthly rank. The cabinet-maker who by an improved tool can accomplish 25 per cent. more work in a given time than heretofore has practically that percentage added to his life. It is, indeed, a fine poetic insight into this fundamental principle which lies at the root of all human progress that makes the Laureate exclaim :—

Better fifty years of Europe than a cycle of Cathay !

Who, for instance, will dispute that had Galileo possessed the accepted mathematical data, the improved instruments, of even Newton's time, his life would practically have been immensely longer than it really was ? We are beginning indeed, to feel that—

Life is not gauged by mortal hours
  But by immortal thought,
And changes its creative powers
  Hath in the spirit wrought ;
And human life is short or long
As feeling may be weak or strong !

At any rate these thoughts were very forcibly suggested by all I saw in a recent visit to the factory of Mr. Charles Owen, in the City Road, where it is not too much to say that a laboratory of practical and most beneficent longevity is in active progress. The valuable services to science of Mr. Charles Owen, and his attainments are, I believe, well known to most members of the scientific world. Judging from what I there saw, I have no hesitation in saying that in the course of a year or so Mr. Owen will have the honour of conducting one of the largest, most important, and most perfectly developed scientific instrument manufactories in the world. Probably no one passing, as I had often done,

the show-room frontage of this building, would imagine that behind there was a large factory, with long lines of benches filled by the most intellectual class of skilled workmen among us, and every proper appliance for manufacturing from beginning to end, every description of scientific instrument that can possibly be needed by the student, the sailor, the soldier, the sportsman, the chemist, the astronomer, and the natural philosopher.

It is impossible to overrate the social importance to all, whatever may be the pursuits or tastes of the individual, of an industry of this kind. Here in the show-rooms, crowded by work, may be viewed telescopes, spectroscopes, microscopes, electrical machines in every known form, air pumps, levels, quadrants, sextants, compasses, ship's binnacles, marine, field, and opera glasses, barometers, thermometers, hydrometers, saccharometers, in fact every kind of mathematical, philosophical, natural, and optical instruments known to science. That which most attracted my attention was an improved astronomical telescope stand, invented and designed by Mr. Charles Owen (the construction of which was lucidly explained by the inventor). In this stand by means admirable in their simplicity, it is so arranged that when the quick horizontal or vertical movement is required, the driving screws are never thrown out of gear—an arrangement the value of which cannot be too fully appreciated. Passing into a kind of inner courtyard, well-lighted by a glazed roof, you find ample space for the exhibition of the larger description of instruments, while here also is the space allotted to the furnace and steam-engine for dealing with the larger and rougher form of the metal-work involved.

In a store room you are shown the dull, rough, inchoate, *disjecta membra* of what is to prove so exquisite a source of delight, so beneficent a provision for dim sight, so precious a means for piercing the deepest mysteries of the physical universe to thousands of human beings. It is difficult to fancy how lumps of unburnished brass, opaque masses of glass, amorphous bits of boxwood still encased with its rough bark can ever emerge even through the agency of one of the busy benches behind you, into a student's microscope or an opera-glass.

The expression of the men working at the benches is very noticeable when contrasted even with that of those somewhat similarly engaged on work merely appertaining to the metallic parts of our ordinary domestic and industrial

necessities. There is an air of superior intelligence in all the faces here, which shows that *mind* as well as *method* is in the work. The earnings are, as may be supposed, high, many of the hands getting £3 a week and even more. And yet, notwithstanding these high wages, and the necessary costliness of the materials used, such is the immense advantage of combination, with all its consequent concentrative and friction-destroying results, over individual enterprise that I find this factory can produce better instruments at a far lower price than the leading opticians and mathematical manufacturers of the day. And, of course, as every one knows, in microscopes, electrical machines, telescopes, &c., first-rate quality in every detail is absolutely essential to accurate performance. I was also interested by the glass manipulatory and polishing rooms. Here are to be seen every tool and requisite for the perfect manufacture of lenses, prison reflectors, &c., and the arrangements of this department are in every sense complete.

There are benches here and dwarf pillars with concave plates on the top, wherein the necessary emery is put for the purpose of enabling the polisher to obtain what surface he requires on the various glasses belonging to different instruments.

In the show rooms there is already, as I have said above, a most interesting and valuable collection of scientific instruments made on the premises; and it is impossible not to feel impressed by all that surrounds the visitor. The pass keys to two worlds—the infinitely small and the infinitely great are daily multiplied in this laboratory of science, and many unwritten contributions to future encyclopædias may result from the glittering lenses around.

The greatest credit is certainly due to the earnest labours of Mr. Charles Owen, the creator of all this industry. He is one of the fact—not merely verbal—contributors to the great Book of Science and it cannot be doubted that the manufacture of such perfect instruments as are here exhibited will greatly accelerate the progress of discovery in some of the most interesting fields to which it has yet been directed. We hear almost daily of fresh revelations in the domains of astronomy; and the new Spectroscopic Association formed in Italy, will beyond doubt greatly enrich the annals of solar history if they can but command instruments as good as those I have had the privilege of inspecting at these works.

THE HISTORIC USES OF WAXWORK.

MINUTE division of labour, rapidity of locomotion, a consequent compression of time, and the vibration of life with the majority among us between the prosaic and the extravagant, the monotonous clockwork routine of daily business, and an occasional outbreak into amusements, best represented by the burlesques of the period, are fast depriving the age of that essential to a really healthy state of society: some infusion of those lofty sentiments which in private life constitutes honour and in public spheres command respect for the nation. The tendency is far too strong to confine life within the present, and render it all-sufficient without either a past or—even a future. No mistake could be greater. No social condition can more strongly tend to a suicidal end, so far as a first place among other nations is concerned. Man no more attains his highest development when historically cut off from the past than he does if condemned, like the unhappy French Communists, to the seclusion of New Caledonia. The steam-engine, the printing-press, the cotton-mill, the telegraph, are all splendid achievements in themselves; but even they had never been but for the men who rose on the progress of the past to command a wider view of the horizon of the future. It is thus that History, in all its protean forms is always the great primer of nations; and we may accept Carlyle himself as a useful teacher for the people in every age,

so far as he has insisted that where heroes are wanting and hero-worship extinct, there a nation worthy of the name will not long be found. The metropolis is only too rapidly epitomizing the English people, and the increasing competition for places in the inferior grades of municipal industrial life evinces daily a deterioration in the tone of the national life. To have thousands of men employed at miserable salaries for the punctual performance of essentially monotonous duties in an essentially commonplace atmosphere of petty, peddling life is by no means calculated to elevate the standard of public moralty. Compensative and counteracting influences are sadly wanting; and the worst-paid rank and file of our legionary clerks alone threaten to exercise in time a most undesirable influence in English manners.

Ignorance is, of course, in a great measure at the bottom of all this. The uncultured man who plants himself and family in the midst of the fertile prairie will never be vulgarized by his ignorance; nature prevents that. But the uncultured man, shut up in a trade nook or a commercial corner of city life, stands a very great chance of being hopelessly vulgarized, and is little likely to develop a single virtue better than conventional honesty and conventional truthfulness. These are, apparently, harsh sayings, but they were suggested forcibly by certain reflections awakened by a visit to Madame Tussaud's Waxwork Exhibition.

Figures of various kinds, designed to represent life, are of ancient date. Aristotle himself tells us of *neurospasta*, or automata which moved, it is asserted, in a very natural manner. Coming to comparatively recent times, we hear of Hans Bullman, a padlock-maker, at Nuremburg, who succeeded in contriving a figure that beat a drum by clockwork. But whatever may have been accomplished thus, and the celebrated automatic flute-player, made by Vaucanson, and exhibited at Paris in 1738, excited universal admiration, it seems to have been reserved for Madame Tussaud and her enterprising sons to develop fully the most latent artistic capacities of simulated life in wax, and constitute, as it were, a new organ for History, through which it might most eloquently express not a few of its highest and certainly some of its most useful functions.

The Hall of Kings, with its generally accurate por-

traiture, its almost perfectly accurate costumes, and its always characteristic grouping, is, indeed, a great national primer of British history which historical students, no less than historical dunces, will do well to examine carefully and often. It is very remarkable how forcibly this admirable revivification of the historic past adds strength, distinctness, and coherency to one's notions of the various epochs here illustrated as merely formed in ordinary reading. In William Rufus (148), for example, the wide almost pouch-like cheeks, making the lower part of the face pyramidal, and the prevailing sleekness of the whole, better enable one to realize the porcine nature of the Red King, who seems to have been destitute of every good quality. It is worth while to pass immediately to Richard I. (153) for the sake of the violent contrast. There you behold :—

> A forehead with a regal arch,
> A chest to stay an army's march,
> An eye where victory's beacon burns,
> A hand that all it seizes turns
> To sceptre swords, until at last
> Such is the spell those features cast,
> Here in the mimicked life you see
> The great Crusade's epitome !

Berengaria (152) is exceedingly lovely, the small refined head and delicate throat being beautifully rendered.

Isabella of Guienne (158) is an interesting study to those who flatter themselves that physiognomy and phrenology are alone all-sufficient to elucidate beforehand the subtleties of human motives. The portraits are fairly faithful; but who, if he did not know the truth, would suppose that the luxurious and handsome monarch was gazing into the face of one who deliberately planned his murder? In some cases, however, we may justly draw deductions from the form, look, and gesture in more or less correspondence with the known facts of history. Henry VII. (159) most certainly looks the mean, miserly, mistrustful grinding ruler we know him to have been, while Henry VIII. (28), towering, in his ungraceful butcher-like bulk, above the group of his murdered consorts and resting a fat hand on the slender form of his doomed son, must be seen to be appreciated. Charles I. (162) looks very much what we believe he was; but James I. (163) scarcely seems the mean, pedantic poltroon he

undoubtedly was; while Charles II. (165) appears as though a clown's motley would suit him with his silly stare and his buffoon-like face, far more than the armour which so ill becomes him.

For many who have yet for the first time to visit these imposing historic galleries there are probably many surprises. Joan of Arc (13), for example, with her simple look and quiet demeanour, utterly devoid of dramatic assumption, is doubtless very different from what many of us *imagine* her to have been; while Wolsey (26), with a contracted look and a kind of pinched-up forehead, has nothing of the august about him, seems anything but a great man, and would, to my mind, have made but a poor Pope —even compared with the amiable Pius IX.

One of the most interesting groups, perhaps, among those belonging to the present time, is that representing the last two Presidents of the United States, together with the reigning one. Abraham Lincoln, in all respects, is a striking contrast to General Grant, whose quiet, resolved demeanour harmonizes with all we hear of his laconic, almost Spartan-like character.

The fine figure of Garibaldi (49) now very appropriately faces an admirable representation of Mazzini; and it is impossible to gaze into the keen, analytical, but benign countenance of the great Italian patriot, without feeling that the impromptu epitaph pronounced by the Ex-Emperor Napoleon—"so then Europe has one genius the less"—was only just.

As might be expected the excellent portrait model of the "Claimant" is a great centre of attraction, exhibiting, indeed, as all the models do, a marvellous combination of the best work of the sculptor as well as that of the photographer.

The great group illustrative of the House of Brunswick is another centre of attraction. Certainly the soul of an Agnes Strickland would be delighted by the splendour of the really superb dresses; and it is difficult at times to escape the conviction that very many of the personages represented are actually alive.

In the Napoleonic rooms the historical student, no less than the general observer, will find, indeed, food for thought. You have here the *disjectæ membræ* of the greatest military empire that the world has yet known. A materialist of the present positivist type must be as

delighted as the general observer to see the entire history of Napoleon the Great, as it were, exhibited in fact —relics of his rise, empire, and fall. All the glories of the French regalia, the pride and beauty of the Imperial Court, are at least suggested by the priceless relics around, while the exquisite cradle wherein reposes the child of France, doomed to so sad a fate, is like a sweet elegy on human greatness set in the pathetic type of symbolical flowers.

The Chamber of Horrors has, on very many accounts, a peculiar interest. At a time like the present, when the question of capital punishment is so freely canvassed, everything relative to what may be called criminal statics is of the very greatest importance. The thing that strikes one most perhaps is the very low physical development noticeable in most of the murderers. One is forcibly reminded of what the Greeks themselves so conspicuously taught through their practice, that there is a necessary connection between beauty and purity of body and that of mind. There are, of course, certain exceptions no doubt, as exemplified in the cases of criminals belonging to the educated classes; but it should be remembered that no rules without exceptions can be laid down with regard to human beings. Even in those exceptional cases, could we only see all the physical circumstances of each, it is certain that what seems very fair material development is, when properly investigated, the very reverse.

The guillotine and the too-faithful pictorial representations on the walls around of the elaborated tortures, which man has, with diabolical ingenuity, inflicted on his fellows, offers in reality a very palpable means for enabling us to perceive why brutality and violent crime generally has lingered so long among us.

The greater the respect in which the Executive of any country holds human life and the person generally, the less likely, we may be sure, is life to be taken or the person violated in any way. Passing, however, from the general to the particular, I must confess that I am wholly opposed to those who imagine that this Chamber of Horrors is in any degree calculated to do moral harm. The direct study of criminal life here is infinitely less morbid than its representation in many contemporary books and periodicals. The halo of romance or the highly

coloured reports of newspapers doubtless do, in certain cases, propagate crime. Here it is different. The whole exhibition is really of æsthetic importance and morally instructive; the former as demonstrating the correctness of the Platonic and Socratic teaching that beauty is but a form of good, and the latter as showing how trifling is even the punishment of death compared to the ineffable ignominy, of becoming an item in the public study of the most detested criminals. Where all is so very good, it seems invidious to particularize a few only of the many really marvellous works of art which here have a fidelity to life which in some instances, almost overpowers the knowledge of the deception, and makes, as it were, every other sense the fools of the eye.

Madame St. Amaranthe (84), watched over, by the way, by Madame Tussaud herself, is alone worth many a visit. Madame St. Amaranthe was, we are told, the most lovely woman in France. I can well believe it. A wonderful similitude to life, in form and feature, is rendered perfect by the artificial respiration.

The whole, indeed, is a visible poem, pathetic in its purity, and one cannot dwell upon this *chef-d'œuvre* without feeling that

> Fresh as the flowers of spring's first hours,
> Bright as a Raphael's mind,
> Tender as love that bends above
> Its object stricken blind,
> Here soul with body seems as blent,
> As with the lily is its scent!

I must not dwell longer on the beauties of this perfect exhibition, which claims a first place among intellectual amusements, while its value as an historical record—ever marching, newspaper-like, abreast of the age—is obvious to all. Just as people read periodically their *Saturday Review* should they periodically inspect the ever-growing collection in Baker Street, where the glory and shame, the beauty and deformity, the wit and invention, the genius and degradation, the progress or regress of humanity are so faithfully represented in the universal language of an art which appears to combine, in the happiest degree, the perfection of photography with that even of painting and sculpture.

A UNIVERSAL BANK.

UNQUESTIONABLY the spirit of the contemporary age has become industrial and commercial; science, invention, and even politics, are wholly subordinated to one or both of these ends. The great diffusion of useful knowledge among all classes has gone far to establish in this country at least, an irresistible tendency towards that happy condition of practical equality, which, without necessitating any organic changes in the existing system of Government, enables almost everyone, however comparatively poor, to enjoy in, at least a degree, the most substantial advantages which formerly exclusively belonged to power and opulence. The post-office, for example, furnishes a striking illustration. Many are living who have had to pay two shillings for a letter and its answer; and for a long time after telegraphy had become familiar to all, the telegraphic message remained a commercial luxury entirely beyond the reach of persons of limited means. It is evident that in the extension among, and the economic application to, the mass of the people of the more complicated machinery of modern life, that two great ends are reached. The one is the, so to speak, insensible blending together of classes formerly sharply distinguished by their class privileges; and the other is the gradual but general endowment of the humblest member of society with many, at least, of the best material gifts of our modern progress. In these two beneficent results, for beneficent they are, we have indeed most reassuring guarantees against those terrible social revolutions, which, among all Continental peoples, have hitherto

invariably come, as the inevitable Nemesis of every known polity, wherein each class stood with peculiar inalienable privileges, sharply demarcated from, at any rate, that one below it. Although that singular school of social philosophers, commanded by Darwin, Huxley, and Herbert Spencer, would eliminate from the future of society government as completely as they have striven to eliminate God from morality, I think it will be found that of all possible civilizations, the best must be that which includes the greatest practicable extension of the co-operative principle, and the widest application of governmental machinery to every department of active life. It is a great mistake to imagine that the extreme development of what is conveniently called public utility—that the establishment of even what superficially appear to be communistic contrivances for the conduct of even ordinary life, can, if judiciously administered and honestly checked, in any way trench on individual liberty, or in the least contract what should always be the sacred area of the private home. It will be found, indeed, on the contrary, that wisely carried out, the co-operative principle is never antagonistic to individualism, and so far from blending individuals into an undistinguishable level, will always present the most efficient means whereby each one among us can attain to the most unrestricted exercise of absolute personal liberty. If this should sound somewhat speculative, it must appear palpably clear, on the least examination, that cheap postage, cheap travelling, and cheap telegraphy, have already borne important parts for good, in that fierce social conflict, which, stimulated by competition, constitutes contemporary progress. Whatever, indeed, exercises a prevailing tendency to cause classes hitherto more or less antagonistic, to coalesce, through the diffusion among them of mutual benefits, must be as important in the eyes of every advanced statesman, as it is dear to the heart of every true philanthropist. Remembering, then, the practical good that has resulted from the extension to the masses, of what may be conveniently termed the necessary machinery of civilized life, it is strange that so little has, as yet, been done, to popularize that monetary mechanism, which, essential to all extended commerce and to every staple industry, would be found of the greatest utility, if adapted to the minor spheres of ordinary trade, or of private life. Taking that great group of the nation's section, the middle class, including its very lowest grades, it may be

said that all more or less, write, travel, and occasionally telegraph; these three important functions have now been amply and well provided for; but a vast proportion of these persons remained without what was in reality no less important—banking facilities. It is true that for a long time past, various attempts have been made to provide, what has been long so urgently wanted, the means whereby persons could enjoy within the narrowest commercial limits, and with only a minimum of money, all those often incalculable advantages which the capitalist has hitherto exclusively enjoyed. Penny Savings Banks, Benefit Societies, and other cognate contrivances, have been but miserable substitutes for what has been so generally needed. They may, indeed, and often have, stimulated providence, but were naturally impracticable in every respect, as even partial agencies for operations, which, in their relative degrees, have to be performed quite as much by private individuals as by manufacturers or merchants. What was wanting, then, was a system of banking for persons, who, although possessing at one time more cash than they currently required, were still precluded from the manifest and generally well-known advantages which the cheque system necessarily possesses over bank notes or even metallic currency. Remembering the stupendous scale on which banking operations are here conducted—as much as six thousand millions sterling annually passing through the London Clearing House in crossed cheques—it is strange, indeed, that an attempt was not long since made to extend the various and substantial benefits arising from the use of cheques to all classes, having from five pounds to five hundred in disposable cash. The importance of economizing the gold currency of the country, and of reducing to a minimum the consumption of bank notes, which the Bank of England daily cancels and daily renews, is obvious. The benefits of the ordinary bank, however, could not be extended to the small capitalist, for the simple reason that he is unable to guarantee such a balance as may make it worth the banker's while to accept his deposit; and even if the ordinary bank would receive small sums, such as the great majority of the middle class of small traders and well to do industrials may be expected to possess, the insurmountable difficulty remained, that the cheques they drew could never be generally trusted in. On the Continent generally the classes to whom we particularly refer being destitute of all banking facilities, are driven to

hoarding, in order to secure their cash; a method which invariably proves a loss, not only to themselves, but to the community. Thousands and thousands among us are daily embarrassed by the custody of small sums, which it is neither safe nor convenient to carry in the purse or deposit in the house. Cash often in practically unchangeable forms—for it is not always that the neighbourhood will change even a five pound note, has to be employed in every transaction; if money is to be safely saved, the cumbrous machinery of the Post Office Savings Bank must be resorted to, and remittances made by the Post Office Order. The problem to be solved was how to introduce such a system of cheques that the whole advantages of the Savings Bank, the Money Order Office, and the crossed cheque system of the ordinary banks, might be perfectly combined at a merely nominal cost, and in a manner applicable to every possible monetary requirement of those who are not obliged to spend the money as they get it or beforehand. This problem—and its scope was national—has been perfectly solved by Mr. James Hertz, the originator and managing director of the Cheque Bank, which has been established for the benefit of all those persons who have till now been unable to participate in any of the many advantages resulting from banking. By the simple, but ingenious plan of issuing cheques stamped with the amount actually paid over in cash by the depositor, and absolutely restricting the total value issued to the actual amount received, the cheques themselves become practically Bank of England notes, and may be invariably accepted without the least possibility of their ultimate return, endorsed with those two terrible words *no effects*. Thus, as an example, A draws a cheque for £1. 16s. 6d. payable to B, or order on a Cheque Bank form stamped £2 or under. Now, it is absolutely certain that this cheque must be honoured, since it could not be issued until the maximum amount of £2 had been literally paid for it; it is, to all intents and purposes, a £2 bank note, with, however, the obvious advantages that it may be used for a less amount, like the crossed cheque, payable to order for a receipt at the same time. By this system, then, the very smallest payments may be made by crossed cheques, while it is absolutely impossible for any customer of the Cheque Bank to overdraw his account. As to the undrawn balances on cheques filled up for less than their stamped value, these are carried forward to the credit of the depositor, become the payment

for new cheques, or may be withdrawn if desired. Every cheque, therefore, on the Cheque Bank actually represents cash of the drawer for whatever amount for which it is drawn, and it must be honoured. Such cheques will pass current even at railway stations, where no other would be accepted, and no one need any longer be at all uneasy as to how he or she can keep safe that spare cash which occasions so much anxiety in many homes. To tradesmen, as well as to the general public, this bank will be an inestimable benefit; merchants and manufacturers may issue to subordinates with perfect confidence batches of cheques for specific purposes, certain that the confidence cannot be abused by using their signature for drawing more than the amount required. In buying goods at shops, in paying salaries, in remitting amounts by post, and generally in the multitude of monetary transactions, which have now to be performed by means of Post Office Orders, the Cheque Bank will undoubtedly be the favourite agency. As to the bank itself, its stability has a threefold guarantee. In the first place, there is an actual deposit with trustees of £100,000 Consols; then there is the large subscribed capital; and, finally, the important fact that the funds of the bank are deposited with a variety of other banks, including the Bank of England, the Western Branch of the Bank of England, Glyn, Mills, & Co., Williams, Deacon, & Co., National Provincial Bank of England, Dimsdale, Fowler, Barnard, & Co., Consolidated Bank, Limited, Alexanders, Cunliffes, & Co., National Bank of Scotland, Alliance Bank, Limited, McCulloch & Co., Herries, Farquhar, & Co., R. Twining & Co., Ransome, Bouverie, & Co., City Bank, National Bank, Union Bank of Scotland, Manchester & Salford Bank, Manchester & County Bank, and others. The security, therefore, given by the Cheque Bank to all its customers will be superior to that of any other bank. Operating with and conducting its business through the medium of London Provincial Banks, its funds will be so widely distributed that the failure of this or that bank will in no way affect its customers. The superiority of these cheques over bank notes becomes at once apparent, when we consider the difficulty often experienced in attempting to pay a tradesman six or seven pounds with a ten pound Bank of England note; the change often cannot be had. You can fill up a ten pound Cheque Bank cheque for the exact amount, and the transac-

tion is concluded without troubling the tradesman with change. The cheque forms, too, are so contrived as to render forgery exceedingly difficult, but of course the signatures of depositors may be forged. Now, as no single cheque of the Cheque Bank can exceed £10 the loss is limited, which it is not in the case of other banks. The system, too, will be applicable abroad; its notes will traverse the Continent and be everywhere accepted as good to the amount for which they are signed. It is impossible within these limits to touch on all the uses which this popular form of banking will so efficiently subserve; and no doubt its introduction will surely, if perhaps slowly, effect a complete revolution in what may be conveniently termed, our domestic monetary system.

But there is yet another aspect in which we should view this unique institution. First, when we consider that the origin of banking is lost in the remotest antiquity, for Moses even found it necessary to restrict the Israelites as to their monetary transactions with respect to lending sums at interest, that it was among Athenian bankers that a system of discounts was first invented, that the Roman *Argentarii*, and in the Middle Ages the Italian *Camera degli Imprestiti* were familiar institutions, and that, in short, from time immemorial bankers in some form or other have been universally recognized as necessary to every civilized State, it does certainly seem extremely singular that so many ages should have elapsed before a really popular application was found for the great principle of banking. Secondly, every careful student of history must perceive that the undeviating and ever increasing tendency of all progressive civilization is towards a wider and more efficient diffusion among the ranks of the people of all those most substantial advantages which were formerly reserved for the ruling classes. Thus what were once even to the wealthy the luxuries of life have been won for the comparatively poor and converted by the universality of their application into mere necessaries, and this process of assimilating to the lower grades of society all the once exclusive advantages of the upper ranks has invaded, and that triumphantly, every sphere of human activity, whether political, industrial, artistic, or manufacturing, so that it has become at last a close approximation to the only form of communism that is likely to prevail—at any rate, while human nature remains unaltered; for after all it may almost be said that in

England the famous formula of socialism is virtually realized, to each according to his capacity to each capacity according to its works. In effect a man can hardly covet anything in these days of practical equality, which, by dint of time and perseverance, he will not be able to secure for himself. Considering, then, all this, and remembering, too, how important are the functions of banking to all who possess even but a minimum surplus over the current requirements of their lives, it does, I repeat, appear extremely singular that the people at large should have remained for so many ages practically destitute of any banking system applicable to their peculiar wants—peculiar and limited indeed, but to them as important as those of the nation itself that enters the money market of the world to raise an urgent loan. I have thus sketched the scope and purpose of the Cheque Bank, showing—but very imperfectly I confess—in some degree how this admirable system was likely to operate. I will now enter more minutely into the working of the principles forming the basis of the business that the Cheque Bank has been instituted to effect—not here and there, but universally—and endeavour to summarize them as far as practicable, for the benefit of my readers, all of whom are presumedly more or less personally interested in the success of this unique, comprehensive, ingenious, and emphatically beneficent system of really popular banking.

How much something of this has been needed may best be inferred from the simple fact that of every 100 of the large class of small traders only seven keep at present a banking account, and beyond doubt every one of the other 93 would derive the greatest benefit from having a banker on a system like that of the Cheque Bank, which, while rendering the cheques drawn by the smallest huckster absolutely as good for the amount on them as is any Bank of England note itself, obviates at the same time all necessity for keeping that balance which is in such a case impracticable, and without which the ordinary bank will not open an account at all. In a word, the scope of this new institution, destined to exercise the most salutary influence on the domestic economy of the people, is essentially democratic, although as experience has already shown, the middle and even, for certain purposes, the upper classes, are beginning to realize for themselves some of the many benefits

arising naturally from this ingenious plan for rendering cheques actually superior to cash in very many respects as a circulating medium. Perhaps the most popular, and, at the same time, the most correct, way to describe the functions of the Cheque Bank is to say that they really enable each one among us to issue his own bank notes, and thus enjoy individually every advantage that results from the substitution of paper for metal, without one of the disadvantages attending the process; no one, in fact, need keep more than a trifle of his available money in cash; the safety, economy, and tendency to save inherent in every banking system is to be found to the full in the system of the Cheque Bank. Among its many useful varieties that will appear in the working of this principle when it becomes more developed. is that of co-operative banks, which will be especially applicable to small provincial towns and villages. A number of petty traders can agree to keep a common account at the Cheque Bank, which will in its turn arrange to honour their joint signatures. These co-operative bankers, if I may call them so, will be able to adjust *their* mutual accounts entirely without the aid of cash, and the present age will see on a small scale a revival of the old times when most traders combined banking with business. The ability, indeed, thus conferred on each one among us to convert whatever cash he possesses into bank notes is of the utmost importance to every member of the community, and marks, I believe it will be found, a distinct epoch in our popular progress. No one probably could have foreseen the real character of the immense impulse to national development which lay latent in the first issue of penny postage-stamps, but everybody knows now how much good cheap postage has wrought the nation, both materially and morally. The principle of these individual bank-note issues, for such they virtually are, is also capable of application to commercial and no less, indeed, to all other travellers. By the issue of circular notes abroad and in the colonies, the Cheque Bank will be enabled, when completely developed, to effect a complete revolution in at least the monetary system of the British people, and extend all its solid benefits throughout the globe. Amongst the minor, but in its effects by no means least important of the details of this unique but, as far as it goes, perfect system of popular banking, may be mentioned the truly admirable system of book-keeping introduced by the inventor of the

whole scheme, Mr. James Hertz. This enables the cashier to see, by glancing at the ledger, how the account of A or B stands, and even in the preparation of the peculiar cheques employed much thought and scientific knowledge have been expended. The paper and water-mark are alike peculiar, and of such a character as to baffle the utmost ingenuity that the dishonest can bring to bear against them. Crossed cheques, indeed, bear an immunity from the most subtle manœuvres of fraud that has never been enjoyed by even Bank of England notes themselves, and *these* are by no means easy to forge. I believe I am correct in the assertion, that no instance exists, or hardly any, of a crossed cheque being paid to the wrong person, and *all* the cheques from the Cheque Bank are so issued. Thus the public enjoys the benefit of a paper currency of a peculiarly perfect character, giving at once the greatest possible elasticity, while securing a degree of safety not possible under any circumstances in the case of cash. And all this has been accomplished, as great things generally are, by the employment of very simple agencies. Whereas in ordinary banks the clerical work resulting from the issue, circulation, and return of 100 crossed cheques amounts to something like, I believe, 500 operations, in the case of the Cheque Bank cheques only about *four* are needed—a marvellous instance of administrative economy. I do not doubt that the day will arrive when the name of Mr. James Hertz will have acquired a real historic importance as the founder and perfecter of a system of popular banking, which will grow and grow until it has become only less common among us than cheap postage and telegraphy now are.

OLEOGRAPHY.

IT has been said, and that by no less an authority than Mr. Buckle himself, that the natural scenery of every country has a prevailing influence upon the character of its inhabitants. There can be no doubt that with some reserve this is perfectly correct. The effect of long-continued colour impressions upon the eyes, for instance, is a palpable example of the result following persistent action on the retina, and the manner in which the mind itself is acted upon by that objective resistance in which we move and have our being, is but little different. That the physical surroundings of our daily life are, on the whole, continually growing more and more utilitarian and commonplace is but self-evident; there is, indeed, a degree, so to speak, of flatness and want of colour in our intellectual horizon, which has produced its natural effect upon most of us. The spasmodic art, if art it be, of the burlesque stage, and of a certain phase of illustrated literature, represent only the inevitable revulsion of beings, who have found what modern life is too generally to all but paupers and millionnaires. Some kind of better reaction against this has long been due. It is needless to say, that the proper remedy of this is a judicious application of culture and artistic taste, as far as possible, to the every-day concerns of ordinary life; it is not well to take art by itself, as most persons do poetry and fiction, in regular doses, for leisure moments. Art, indeed, should penetrate into the very warp and woof of our daily existence, and, indeed, be inseparable from it. But half the misery and much of the evil and even crime of this

life would disappear if the mass of the people had culture, and were accustomed to discern rightly the true beauties of Nature, and adapt these each one to the domestic decoration of his or her outward life, is but a truism. I have been led into these and some similar thoughts from having seen recently a means—which seems little short of marvellous—whereby the highest art can be made subservient and easily adaptable to all the household requirements of every one among us, whether he be rich or poor, and this, too, altogether as unique as it is perfect. In the first place, there can be little doubt that pictorial has, in its way, as great an influence on the majority of people as literary art; indeed, many persons are profoundly impressed by a picture who are in no ways affected by a book; and the influence of a picture constantly before one, always appealing to the eyes, produces, though insensibly, an effect upon the mind far beyond what might be supposed. Most thoughtful men of a philanthropic turn have deemed it important that for the mass of the people, including, of course, the well-to-do and tolerably cultured of the middle classes themselves, the grand works of the old masters—all the pathetic appeals that the pencil of the painter has ever made to the imagination or the heart—should be within the easy reach of all. Hence the establishment of National Galleries and other kindred collections. But this is very far from sufficient; it is in the degree in which high art is domesticated that the value of a people's culture really depends. Here, then, was a problem to be solved, and it would appear that in Oleography that solution has been happily found. The bare notion of *printing* and painting in such a manner as to multiply practically, without limit, seems at first startling; especially when it is added that the copy shall be virtually equal to the original itself. During a visit I paid to the establishment of Mr. George Rees, in Covent Garden, I had the opportunity of observing how far this admirable reproductive art has yet gone; for in his galleries of oleographs are to be found the germs of a great art revolution, in this country, at least. On inspecting these galleries you cannot help fancying that you are among oil-paintings whose value would make a hole in the national revenue. You see around Rubens and Raphael, Murillo, Guido Rene, and a whole host of masters, both ancient and modern. It is only, indeed, in seeing some of them repeated, that the delusion is dispelled. It would

be easy, indeed, to construct a gallery of any period of painting out of the ample material around; the only drawback, perhaps, to one's enjoyment of the whole, is the reflection that many coming here may feel slightly disappointed to find again those treasures of art, which they have purchased at, perhaps, fabulous prices, in the hope of becoming the exclusive owners of some cabinet gem. It has always been a subject of the profoundest regret that the finest works of the painter's brush are necessarily perishable. Literature may, indeed, be deemed as immortal, in, at least, an earthly sense, but not so with paintings; in any case the time must come when decay deprives us of the most splendid efforts of human intellect and imagination. In Oleography, however, we have an art which stereotypes for ever all that is most dear to art, and at the same time places it too within the reach of all, so that it shall be no longer, as once, the exclusive privilege of the very rich, to taste the pure delight and refined pleasure that come from the happiest issues of inspired genius. I can but suggest here all that will necessarily result from this new art, its application is as universal as our homes, and there can be no question that it will not be long before the wide circulation of the results of this happy invention will produce a marked effect upon the character of the nation at large. The process, indeed, bears the same relation to high art that cheap painting to the times when knowledge was preserved by the few and sold exclusively to the rich. Henceforth all will be very different. It is indeed something marvellous to think that—

Rembrandt the lord of light and shade,
  And Rubens of the rainbow brush,
Correggio, o'er whose genius played
  The heaven lights of a sunrise flush;
The tenderness of Claude Lorraine,
  The magic of our own Maclise,
The Shakespeare art of Turner's brain,
  The majesty of Veronese—

can all be summoned around us on the very prosaic condition of, say—a pound a foot, excluding frames. This is not, perhaps, a very lofty way of putting the thing; but it is practical, and if in the future, art like literature should be for the mass of the people, who can doubt the real good that will follow.

THE ANUCAPNIC LAMP.

THERE can be little doubt that gas is not destined, as was once expected, to supersede all other forms of artificial light. During an industrial ramble I went over the London factory of Messrs. Rowatt & Sons, where I inspected the details of a lamp of peculiar construction which seemed to require to be known only in order to be universally used wherever gas is not already, from various causes, in possession of the field. The lamp in question is called Anucapnic, from the Greek *ανευ* and *καπνος*, "without a chimney." It has two domes, instead of one, as in ordinary lamps. And one dome incloses the other, a series of perforations admitting the air at the bottom. The result is that while one current rises directly to the burner, the other, passing between the two surfaces of heated metal, joins the central current, and the two currents acting together on the flame, cause the combustion to be absolute, consume the smoke and wholly obviate the escape of any unburnt vapour from the oil. It will be at once perceived how powerful must necessarily be the air current passing between the two shells of hot metal, but this, acting in conjunction with the ordinary air supply to the wick, renders these lamps superior to any other kind. No chimney at all is required—a circumstance that will be fully appreciated by all who use lamps of the ordinary kind.

By Messrs. Rowatt's ingenious invention chimneys are wholly superseded, and were this the only advantage of the Anucapnic lamp the economy thus obtained would place it far before all other lamps. Besides there is no smell or smoke; the light given is strong, clear, and steady.

The Radiator lamp is another ingenious adaptation of the same principle as Messrs. Rowatt have applied in the case of the Anucapnic, the only difference being that in the case of the Radiator the wick is circular, and gives, of course, a circular flame like an argand burner. The flame is acted upon by a double dome, producing two distinct currents of air, as in the Anucapnic, and a flat bottom or deflector held in the centre of and just above the wick spreads out the flame all round it. When this button gets to a white heat the light is most dazzling and brilliant, and when properly trimmed these lamps give a light equal to fifteen candles as shown by the photometer.

Both the Anucapnic and the Radiator are most easily trimmed and simple in construction, and cannot possibly get out of order. The wick for the Radiator is put in at the bottom of the burner in a flat state, and is gradually, as it is turned up, formed into a circle, thus saving the immense amount of trouble usually found in trimming lamps with circular wicks. Any close observer must have noticed how lightly, so to speak, the flame in paraffine lamps is attached to the wick. In effect, indeed, it is only the gas emitted that is in actual combustion, the wick itself lying, as it were, in the hollow of a flame. Now it is evident that a flame of this character is exceedingly liable to flicker. The upward rush of hot air inside the lamp glass encountering the general body of air above at a much lower temperature, naturally produces a struggle, and reacts on the flame so as to render it tremulous. Messrs. Rowatt & Sons, however, have wholly overcome this great and for a long time insurmountable obstacle to a steady flame by an expedient as simple as it is efficient. By placing a piece of fine wire gauze over the globe of the lamp, the ascending column of heated air, instead of encountering the cold stratum above in a body, meets it after traversing the fine meshes of the covering net in a number of points, and thus pierces the cold air without creating that agitation which in all other lamps causes the flame to become unsteady.

There is also an admirable stable lamp, so contrived as to secure those great desiderata—safety and the power of regulating the intensity of the flame at will. There is, first, a chimney on the burner, and, secondly, an outer globe, while an exterior wire guard can be added, so that breakage cannot have the usual dangerous results of these mishaps in

the midst of all the combustibles which are peculiar to the stable. More than this, by means of a slide the air can be admitted more freely to, or partly withdrawn from, the burner, so that on going into the open air the lamp may be rendered thoroughly windproof.

Regarding economy, these lamps, fitted with the Anucapnic arrangement, are striking examples of the saving that may be effected in lighting up a house. The burner numbered 9 burns half a pint of oil in 6½ hours—the cost being 1¼*d.*—and in this case the light is exceedingly brilliant as well as steady. The geographical range of Messrs. Rowatt's manufacturing operations is considerable. The ornamental portion of their lamps in Bohemian glass comes from the country to which it owes its name; the oil is made by the firm at Kilrenny, near Anstruther, Fifeshire, while the brass portions are manufactured in Edinburgh. These *disjecta membra* are put together in the London factory. There you can see in one of the departments a number of grindstones at work for shaping and finishing the rather rough materials that come here to be converted into these ingenious and beautiful lamps. The process of frosting is effected by means of a large brush with strong wires for hairs, which is pressed firmly on the surface of the glass, to which opacity is to be given while the latter revolves with great velocity; in another case you can see a variety of patterns cut on the glass by pressure against a swift whirling wheel, the judgment and skill of the workmen being called into full play. The various parts of the lamp are put together with the utmost care, and, in order to ascertain the truth of the adjustment, each is placed, after the necessary junctures have been completed, on a circular iron table, turning on a pivot. If on gently spinning this round with the newly made lamp upon it, there should exist any inaccuracy in the level of the junctures, the lamp must wobble, and in this case has to be re-made. There can be no doubt that these Anucapnic lamps are, as lamps go, perfect; the light given is very great in proportion to the oil consumed, and the entire disuse of chimneys an economy of the greatest importance. At once, therefore, convenient, efficient, and economical, they are very ornamental, and all who once possess them, will hardly use any other kind of lamp.

AN INK FACTORY.

THERE are few things that illustrate better the general progress of mankind than a visit to one of those factories where some common, cheap, and indispensable article of general consumption is manufactured. I have often thought how many among us, who are for ever complaining of their evil lot, would perhaps come to a more healthy frame of mind could they only visit in succession all those great industries which, in some way or other, supply them, as well as the rich, with matter-of-course comforts and conveniences which some generations ago were beyond the reach of kings and czars. The comparatively small drop of ink in our desk bottle scarcely suggests chemical works of very considerable extent, where a large number of men are working all the year round in order that our ink-bottles may be filled. A pennyworth of ink goes a long way on paper, and it must surely take a good many pennyworths to maintain hundreds of men in making ink at wages of £60 or £70 a year, and working on ceaselessly from day to day. We cannot, intellectually speaking, do without ink any more than, physically, we could do without blood; and if any of my readers desire to receive a vivid idea of population without the annoyance of entering a crowd, they should visit such works as those of Messrs. Blackwood & Co.

Buried in that rather intricate labyrinth of factories and warehouses that lie between Cannon Street and Thames Street, I found the ground-floors chiefly devoted to packing purposes, while rows of casks for export are here more

suggestive perhaps of the brewery than of that ink which we are used to think of in such very limited quantities. These premises are generally much more airy, better lighted, and I should think more healthy than some I have visited; but, of course, as might be expected, ink is present throughout in overpowering proportions, and before you leave you are apt to feel, as I did, very much as though the only legitimate costume in which to visit the place were a suit of blotting-paper.

On the top floor of all, the ink is actually made. The process, though chemical, is by no means complex. Galls, the sulphate of iron, and gum, are infused in water. But then it must be remembered that these solutions are made in great vats; and considering that in a leisurely walk round I saw sufficient ink to float a small vessel, it may be readily perceived that no ordinary crowd could give such a lively impression of population as a simple inspection of those silent, dull-looking butts filled to the brim with what at first glance resembles dirty water.

When the proper ingredients are duly blended, the ink, in a measure, makes itself. When two days old it has scarcely any colour, even in an ink destined to become a jet-black; but it darkens gradually, and, after keeping some two months, attains its proper hue. Nothing then remains but bottling, and it is ready for use. Nothing perhaps is more commonplace than these great reservoirs of fluid in their various stages of deepening black, and yet nothing, perhaps, is more suggestive, for you can scarcely help reflecting that neither a park of artillery nor an imperial railway will, on the whole, effect so much as what appears:—

> Judged by the eye of little worth,
> And far from all one would suppose;
> Becoming that to which the earth,
> In some sense all its progress owes!

But, simple as the manufacture may seem, the successful production of really good ink depends on the manufacturer being an efficient chemist; and certainly when once you enter the laboratory, you pass at once from the sphere of mere mixing and self-settlement to that of scientific calculation and thought. One of the most conspicuous advances that has been lately made in inks, is undoubtedly the new marking ink Jetoline, which enables you to write with the same facility on any textile fabric as with ordinary ink on ordinary paper, requires no troublesome preparation before

the fire, and remains unaffected by time or the friction even of washing. Indeed, so indelible is this ink, that it is easier to destroy the fabric itself than to obliterate the Jetoline writing thereon. It has, it seems, been employed advantageously in calico-printing; and I saw some beautiful specimens of printing taken on linen. The design was singularly clear, and would be, by linendrapers, included among their "fastest" colours.

In other inks, also, Messrs. Blackwood & Co. have attained high excellence. Their red and copying inks are now preferentially used in Government offices, and appear to me unsurpassed for brilliancy, durability, and its perfectly pellucid character. I understand that, after a strict analysis, ordered by the Comptroller of her Majesty's Stationery Office, of the copying, writing, and red inks of various makers, the Government chemist decided that Blackwood & Co.'s copying, black writing, and Rubian red inks, were of the best quality, and they were invited to tender for all these inks for the public service; their tender for mercantile copying and Rubian red ink was accepted. These inks they now supply to the various Government offices in the United Kingdom, India, and the Colonies.

Two other branches of the industries usually associated in our ideas with ink are here represented. These are, respectively, the preparation of gum and that of sealing-wax. The former was altogether different to anything I had ever seen. No person, seeing the great vessels containing the gum in its crudest state, would imagine that anything fit to close a perfumed note to a lady could ever be eliminated thence. As a rule, gum is thick, stringy, foul, or else thin—consequently weak and useless. Instead of taking pains to produce a really good article, the manufacturers too frequently confine themselves to producing the cheapest possible mixture of a maximum of water and sediments, and a minimum of pure gum.

Messrs. Blackwood, however, have perfected a system of filtration which certainly deserves great commendation. Long bags of a cone-like shape, apex downwards, are suspended over jars, and the very essence only of the purest gum slowly expressed drop by drop in such a way that the utmost purity and tenacity are at once attained in the filtered results.

I have had, indeed, some gum before me made thus, and on holding it to the light it was clear as a piece of amber-

coloured glass, although at least double the strength of any I have yet tried by other makers.

In another portion of the premises the manufacture of sealing-wax is carried on.

The principal article, apart from the colouring matter, is shellac, together with other ingredients to improve the consistency of the mass. These are melted and mixed in a large vessel, standing, at intervals, along a room where many men are busy with their smoothing tools on tables of metal, whereon they quickly manipulate the plastic wax into sticks. In making bottle wax metallic moulds are employed. Pieces of cast iron, each the model of a single step, are placed back to back, thus leaving in the space between the exact matrix required for forming a stick of wax by pouring it therein when in the liquid state. As soon as it is cool, the steps are separated, and the wax is made. The more expensive sorts are made and polished by hand. A man takes a stick, offers it for a moment to the fire, and then rubs it with rough paper. The ordinary qualities are polished by arranging a number of sticks side by side, and just passing a heated iron along them. Considering the character of the ingredients, the fact that in this latter case the sticks have to be ironed four times,—once for each surface, and then stamped with the hot die, and afterwards neatly packed in a box, one cannot but admit that the price of a stick of sealing-wax is not the leas tamong the triumphs of civilization. When, indeed, one considers how much the unpremeditated co-operation of men has achieved in obtaining the highest results of elaborate labour at the lowest rates,—as in the case of a half-penny stick of sealing-wax—it certainly does appear that, so far, the "International" has by no means accomplished what was expected of it in some quarters.

All the work here, as in the ink departments, is done by men who are paid by quantity, and earn from £60 to £70, or even £80 a year. I could not see that the work was in any respect as unpleasant as one might at first suppose, and it is constant. All the year round, in every stage of its progress, the different operations proceed, so certain is the demand; the vats of ink are ever full of the fluid in every stage of its manufacture, from the fluid that would only smear the paper like dirty water, to that which will fully justify the truth of the well-worn saying—*Scripta manent.* It is, however, by no means all inks that really merit the

latter description. Vast quantities of ink are now made at so low a price that I have seen myself two large bottles sold for one penny. Such ink is comparatively worthless; it is little better than water stained with ink.

Messrs. Blackwood & Co., have produced an old English black-letter writing ink, which for those desiring to read MS. easily and to have the wfiting itself permanent, is a decided boon. It is somewhat curious that—but a thing of course familiar to all who come in contact with old MSS.—that very many works written even two centuries ago present now, a far blacker, and hence more legible appearance than some documents recently written. It seems strange, indeed, that our ancestors should in such an article as ink have so far surpassed some of our manufacturers in the present day; but the fact is beyond dispute. Really good ink, flowing readily from the pen, never clogging it, and exercising little or no corrosive action upon it, is, for all who have to write much, not only a comfort but a necessity; and such an ink I have found in the samples which have been to me no insignificant facility in writing some of my Metropolitan Industries.

It must have been noticed by many of my readers that of late a so-called violet-black has been greatly used. I believe, indeed, that when I first observed the new colour I pronounced it to be too sentimental for business purposes. Seeing, however, in one of Messrs. Blackwood's vats a considerable quantity of this very uncommercial-looking fluid, I was informed, in reply to my inquiry, that they found themselves bound to make this particular ink on account of a certain demand which exists for it. For myself I had, of course, no objection to the ink but that fanciful one founded on its romantic colour; black or red being, one would suppose, alone admissible hues for recording mercantile transactions, unless, perhaps, in the single case of those invariably illegible documents—butchers' bills. There is, however, an objection of a very serious character to the employment of this so-called ink, the use of which is said to be increasing. It is only a logwood dye, and entirely destitute of that metallic adjunct which is really indispensable to the successful composition of any ink which is to be permanent. On pouring a little out on a piece of paper it seemed to me very like a fruit stain. It is, in fact, a great deal more like dew upon a cabbage-leaf than what ink should be on paper. You may almost wash it out with a

sponge; and for signing documents of legal value, cheques, and other important mercantile instruments, such a miserable apology for ink is fraught with an amount of risk that should at once confine its use to idle men, ladies, and children for scribbling purposes. There is, in fact, so much peril is using a compound of this description that I hesitated about mentioning the subject at all; but experience abundantly teaches that publicity in things like this does nothing but good, since those who are likely to make an ill-use of the knowledge are pretty sure to possess that knowledge independently, and in letting every one know to what a treacherous agent many persons are foolishly trusting their honour and their property, some amount of good can hardly fail to be done.

Some time since, indeed, a widely circulated journal, in reference to certain cases of breach of promise of marriage, alluded to some American who professed to have made an ink which would entirely fade away in a few months and leave the paper perfectly blank. Now this violet copying ink, whose use has become so extensive, is in practice perhaps more dangerous, for it can be removed from the paper even to the extent of the portion of a word, only in a manner that defies detection, and with the utmost ease and quickness. A cool, collected person might, under pretence of blotting a document, alter a letter or a word in the very presence of the witnesses; and this fact alone would, one might well suppose, be quite sufficient to prevent people from employing so perilous an ink.

A FACTORY OF LUXURIES.

UNQUESTIONABLY luxuries should be included among the utilities of life. But no terms, perhaps, are more confused than necessity and luxury, which should minister to the lowest in the social scale as well as to the highest with only a relative and not a radical difference between the two states. A life wholly divorced from luxuries of every kind is a life deprived in a certain measure of individual dignity. When the labourer is reduced to a mechanism by the legislative political economist of the day, and calculated as consuming so much of this and so much of that, we may be sure that personality is shortly to be sacrificed to principle, and labourers will be socially repressed for fear of infringing on the preserves of a privileged class.

In the very heart of the Strand, and as yet seldom or never regarded from this, its only proper view-point, so far as moral results go, by the busy crowds that sweep incessantly past, is a great laboratory, so to speak, where luxuries are converted into utilities and where the art of blending both with beauty has already attained a degree of excellence which is rapidly relieving us from the reproach of some continental cynic, who, roughly translated, declares that—

> Ugly comforts are as good
> As pretty ones to Britons rude.

Few, indeed, fancy, or even think, as they look at the two great blocks constituting respectively the warehouse and manufacturing establishment of Eugene Rimmel, that in that great brick hive there are some hundreds of human bees converting the nectar of whole prairies of flowers, the once

glowing glories of acres of roses, the concentrated beauty of many an oriental day—into a thousand little articles—half necessity, half luxury—destined in due course to be disseminated far and wide, many, indeed, carrying each its little object poem to places and people where a shade of refinement or a gleam of beauty is a substantial blessing and active good. To compare, as I have done above, the interior of this great establishment to a bee-hive is rendered apposite by the singular order that characterizes its interior arrangements. The workrooms and perfume laboratories are mostly spacious, well-lighted, and remarkaby clean. As you pass to the floral department a lift slowly travels up loaded with a few hundred weight of rose-leaves, the harvest of a royal summer. Comfortably seated at clean deal boards forming a continuous table are rows of quiet, neatly dressed, and in some cases, ladylike looking girls and women. They are all busy with the agreeable chemistry of the toilet. Some, perhaps, pour a cream, which is, possibly, to constitute many fashionable complexions, into bottles; others cork, and others again label them, while children with, as far as I could judge, happy faces, cut out the necessary labels from sheets of a thousand or two. Division of labour is the mainspring of all, and the whole series of operations proceeds as regularly and much more quietly than sentimental toys.

If, leaving the upper regions of the bee-hive, we dive into the basement, there we find the softer sex replaced by a troop of men with brawny arms and turned-up sleeves, whose mission it is to bring through all its stages of confection an article intended to confer a benefit on the *unwashed* of all nations, and purify skins of all hues, from the fairest lily to the darkest ebony; *soap*, in a word, that great *civilizing* agent, if we admit the axiom that "cleanliness is next to godliness."

Some of these men kindle fierce fires which generate the all-powerful and pervading steam, others stir in huge caldrons the viscous liquid, or pour it in iron frames whence it is extracted when solidified. Others again cut up the soap into slabs, bars, and cakes in a wonderfully rapid and ingenious manner, and stamp it with a press into curious shapes, after having dried it in a place by the side of which the climate of Ashantee would appear delightfully cool. Then, recourse is had once more to the nimble fingers of women to clothe the soap in attractive wrappers, and arrange it neatly in boxes.

Thus far I have chiefly described what may be termed the *serious* part of Mr. Rimmel's factory, but he also produces in very large quantities *fancy* articles, such as Christmas cards, scent-boxes, crackers, valentines, &c., and those form a still more interesting subject of study for a stranger. Let us take valentines as an example.

In this department you find working-rooms, with long tables and benches on each side filled with eager, but quiet women and girls, buried as it were among the fragile and glittering trifles with which they are to construct the dainty favours of 14th of February.

One example will typify all. A girl begins with a simple sheet of white paper with a lace border. Her tools are few; scissors, a pair of small steel pincers, a gum bottle and brush, and an abundance of separate sheets of flowers, foliage, and all that you see in the stock-room, suffice to produce what is often the most exquisite of tangible and inarticulate poetry. A rose is attached to the centre, a brooding bird is added, and a framework of blossoms gummed to the edges one by one. In a comparatively small valentine I counted seventy rosebuds, every one being separately fixed—a task that, unless seen, one would say no human fingers could be delicate enough to accomplish.

Many of those thus engaged display an artistic taste which makes one momentarily fancy that they deserve a better sphere. But the occupation is pleasant. These little pictures, which will be in many cases charming photographs of the heart, carry for the greater part true happiness into many homes, and to a fanciful mind it might even appear that many a Royal Academician really diffuses less general pleasure through his costliest canvas than these anonymous artists of what may be called the pictorial speech of the home affections.

The stock-rooms for giving out materials, might lead one to suppose that valentines had become as common as letters: shelves on shelves are packed with sheets, each as large as a morning paper, some consisting only of cherub's heads, fairy faces, glittering butterflies, miniature birds, ready for cutting out and delivery to the valentine-makers. There are sheets of rustic gates, cottage windows, rural churches, gothic arches, mythological temples, fairy lakes, frosted forests, and other similar devices, besides an immense variety of paintings delicately executed on silk, or rice paper, representing all the riches of the floral world.

All those, however, may be termed the *ancient* materials of the valentine-maker, but Mr. Rimmel in introducing his *Utile Dulci*, or Practical Valentine, has greatly enlarged the requirements of the manufacturer. Now, besides the marvels of printing, colouring, gilding, and embossing, he has recourse to the more solid attractions of birds or ribbons that can be worn as a *coiffure*, fans, smelling-bottles and jewellery of every description. Humming-birds with their brilliant plumage are reproduced in the similitude of life, as peculiarly happy additions to the flowers, which once alone composed these emblematic offerings; while there is quite a consumption of garnet brooches from Bohemia, filigree parures from Genoa, rococo lockets from Hungary, mosaic brooches from Florence, and even bronze ornaments from Japan.

Some people may think that the introductions of such things is foreign to the origin and purpose of a valentine, but it must be borne in mind that these valuable presents are enshrined in a frame of flowers or other ornaments recalling completely the nature of the offering.

In the better classes of work, not a smear of gum is to be seen, and yet the work will be as strong as the paper beneath it. In the more elaborate kinds, there can hardly be less than fifty distinct operations; and yet a valentine is finished with a speed that is only equalled by the harmony of its many parts. These work-rooms, in fact, are in their way schools of art, where painting is done with artificial flowers instead of pigments. The variety of outline in the floral frameworks of these delicate productions may be best appreciated by the fact that there are, in some cases, a hundred variations on one pattern: thus placing at the command of the worker a practically infinite scope for pleasing combinations. All of these are scented; and the scene might be poetically described as what might be looked for if whole clouds of Eastern birds were to shed their glittering plumage: apple orchards in spring, to flutter down their choicest blossoms on beds of violets; while over all went flashing forth the freshest lustre of an Orient sunrise. Here, indeed, is inarticulate speech of the most persuasive kind. There are lilies that will have, perhaps, most tender voices; roses with fragrant lips that will make secret music in many hearts; and delicate pansies that might have been kissed by Ophelia herself.

ARTIFICIAL FLOWER MAKING.

THE reproduction of nature, under conditions often more favourable than her own, is surely one of the most useful arts of our civilization. The savage may be, and often is, delighted by the more beautiful or splendid aspects of the physical world in which he lives, but it is only the civilized man who has learned to introduce the most lovely hues of sunrise and sunset, the glorious rainbow, the perfumes of spring and summer into his home amid even the dreary depths of a northern winter.

In some measure I think that our external surroundings in the shape of dress, lodging, and scenery, are accountable for our moral temperament, and even, in a great degree, our conduct. I have no notion, of course, of entering into the vexed question of innate ideas; but common sense, without any reference to philosophy, suggests that, as a general rule, outward natural beauty usually elicits from those long exposed to its influence some kind of correspondence.

We see this fact exemplified in the case of plants, which, deprived of light, droop and become blanched; and I doubt not that proper examination would find many similar results of sympathy between our outward physical and our inward mental life. At any rate I do not think that any one could well inspect, as I have done, one of the largest of our metropolitan artificial flower factories without feeling himself in the presence of an industry which, independently of the pleasure that it may give to those for whom the work

has been done, can scarcely fail to exercise a considerable moral influence far beyond the immediate object for which the labour is designed.

Baker-street, of late years, has become a kind of Bond-street. Amid the growing display of the generally advancing shops is one which, far less obtrusive than the rest, wears a true artistic aspect. The few carefully selected flowers, wreaths, &c., of exquisite taste, signify the nature of the business carried on within; but few persons probably imagine that behind this elegant but altogether modest front is quite a hive of human industry, where one might say whole hothouses of the rarest blossoms are daily turned out in an enduring form, and many of the choicest favourites of Eastern, as well as English, gardens are here crystallized as it were into the loveliest form of longevity.

The actual factory consists of several houses extending through to the side street, and at first it is somewhat bewildering to a stranger to pass up and down stairs through endless swinging doors and dark, crooked passages.

To begin at the beginning, there are the raw materials, silk, satin, muslin, and velvet, gold dust, powdered glass, colours, gum, wax, and wire. No heap of garden mould and handful of assorted seeds are farther from the beauty resulting from their union in rain and sunshine than those *disjecta membra* are from the lovely forms into which dexterous fingers and quick eyes will soon compel them to pass. In one room you see a number of racks containing dies and stamps employed in cutting out the individual leaves and petals. Every imaginable form in nature may here be seen —roses, tulips, lilies, and daisies being, perhaps, the most common. There are some thousands of these stamps, and as each costs on an average ten or twelve shillings, the amount sunk in this portion of the stock alone is considerable.

On the top floor is a stiffening room. Here the sole business carried on is the preparation of the basis of the future flowers by starching the various substances used into the proper consistency. The various fabrics employed are stretched on frames and starched; a good deal of this is now done for the flower manufacturer, but a large quantity of starching is done at home. When the fabric basis of the future flower is thus ready, the next process is to stamp out the separate leaves and petals. The smaller patterns are struck out at a blow, thirty or more at a time. Boys stand in front of powerful presses, the hot plate beneath is kept at

the right temperature, and the rapidity with which the process goes forward reminds one most of steam-printing.

In another room you see a large table covered with artist's materials. In one place are men busy bronzing leaves: some sprinkling powder on the highly polished leaves, in order to give them a more natural appearance. The best kind are steeped in wax, the vessel containing it is sunk into a hot plate, such as I have seen in a wax-candle factory. The painting the separate portion of each flower is very carefully performed. You might almost fancy that water-colour painting was proceeding from the delicacy of the colours employed.

There is a great deal of work in the individual parts of even each blossom. The original substance, whether satin, silk, muslin, or velvet, must be stiffened, stamped out, veined, waxed, dusted, and finally mounted. The more elaborated of the specimens shown me go through at least eight or nine different processes before they are fit for their ultimate destination. The frosted flowers are gummed, and then dusted over with fine powdered glass sifted through a muslin bag.

It is, however, the mounting-rooms, perhaps, that most strike a stranger. Superficially they are pretty, indeed; at long tables sit close rows of girls and women, for the most part nicely dressed, and nice looking, each with a little assortment of artist's materials before her. In front of each row of workers are two brass parallel rails, exactly like those you see in counting houses for resting ledgers, &c., on. These are piled with flowers in every stage of manufacture. The general *coup d'œil*—the bright and often pretty faces, the busy fingers, the pleasant rustle of green leaves, the glitter of brilliant colours, the heaps of lovely blossoms—looking like the spoils of a hundred hothouses—the almost musical dexterity with which petal is added to petal, the general smoothness of the whole process, all these I say compose a picture which must live in the memory even of those who have seen it but once.

And here it is in place to mention that Mr. Botting has introduced into his factory an admirable system of payment according to results, together with participation in extra profits. Each mounting table is in charge of an experienced forewoman, who, having a certain pattern to get out, puts a price on it, and arranges with the firm for an equitable amount. It is needless to say that both sides know exactly

the value of so much work. It then becomes the object of the table to turn out good work quickly, and to keep the pattern working as long as possible. The various hands under the forewoman are paid by her according to what she deems them worth. As there are other tables in precisely the same condition, any attempt at tyrannizing by giving too little is defeated by the fact that the clever hand is sure to be bid for by a rival forewoman. Thus one acts as a check on the other. This is, I think, an admirable plan. It answers many good ends. The monotony of the toil is happily interrupted, redoubled energy is certain of its proper reward, and stimulants are offered in the great majority of cases to bring about results satisfactory to both employers and *employés*.

The firm benefits by this enlightened policy. A good pattern is kept secret. Instead of the very workpeople themselves betraying it, each is anxious to keep a new pattern exclusive as long as possible. It is clear, of course, that the longer a pattern is worked the more successful do the hands get in its manipulation; and thus each has a personal interest in retaining a profitable monopoly.

I was shown, too, several deaf and dumb flower-makers, and it seems that employment has been given at different times to many of those thus afflicted, some of whom contrive to perform their tasks with surprising skill.

All the work turned out here is of the best kind. From beginning to end I saw no flaw. The labour is not, except in the case of the stamping, very rapid: too much care is expended on each individual part. Something of the deliberation of painting is to be found in the composition of even very ordinary flowers, and as many artistic and clever hands can rise to a position earning £50 or more per annum—a fair income for a woman—there is ample encouragement for all.

The rooms are all comfortable, and nowhere does the labour appear very laborious; the heavy part of the work is done by boys and men, and for the greater part the industry wears all the appearance of artistic pleasure reduced to method.

A LUCIFER MATCH MANUFACTORY.

IT is almost, perhaps, in its application to the minor essentials of ordinary life that the progress of our civilization becomes most reassuring and conspicuous. In rearing the palatial portions of vast cities, cutting wondrous mountain roads, or building stupendous viaducts or bridges, comparative barbarism even has rivalled in some degree the greatest works of our own era; but in the diffusion of the most important material conveniences, and particularly in placing the mass of the people on a daily rising level of domestic comfort, it is plain that civilization owes its greatest advances to the manner in which science and capital, concentrated on most of the necessities of life, enable everybody to enjoy, almost without an effort, advantages which when they existed at all were always the almost exclusive privilege of a luxurious few. It is thus only, indeed, that humanity achieves permanent progress. Every improvement in the arts of domestic life which enables people to accomplish now, at a trivial outlay of time and money, what formerly cost much of both, naturally frees so much time and money for other things; and however disappointing individual instances are to the superficial moralist, in the aggregate the world at large is a gainer in the best of all ways.

Historically, most of my readers know that it is not very many centuries since an iron or brass pot, a wooden pillow, and a few yards of coarse cloth constituted the principal movable property of an ordinary English agricultural labourer. Whenever practical perfection is attained in

anything of universal use, a large addition is necessarily made to the common stock of our joint advantages, and in the possession of his pocket-knife, tobacco-pipe, and lucifer matches, the poorest man of the present day enjoys advantages that some Roman Emperors would have purchased at the cost of a province, if they could not have obtained them on any other terms.

These remarks apply, of course, to all the fact-details of ordinary life; and thus is it that true civilization is ever *maximus in minimis*. The present generation is so used to lucifer matches that few persons reflect on the time when to obtain the initial light for household purposes was quite an elaborate affair, scarcely inferior to the serious nature of the task that the savage has still in general to perform if he requires a fire—namely, patiently twirling a dry stick round and round in a hole made in another dry and large piece of wood until the friction produces the long-expected sparks.

Few, perhaps, of my readers have a better notion of the manner in which matches are manufactured than myself. Accustomed as we are to regard the match as equally insignificant and useful, one is scarcely prepared to find that the actual work of production is on an enormous scale, and that the unremitting exertions of several thousands of persons are only sufficient to keep us fully supplied with these little but highly important household neccesaries.

Probably the notions of some of my readers will be as much modified as mine after a day at the extensive works of Messrs. Bryant & May, at Bow.

Large as these factories are externally, it is only on entering that a just idea of their real extent can be formed. There is first a warehouse simply for storing the materials of which the boxes alone are made, which would easily contain a respectable block of medium dwelling-houses. So enormous is the consumption of these boxes, that the work is put out to quite an industrious colony of persons mostly living in Bethnal Green, who come regularly for the wood and paper and return the boxes manufactured thence in great truck-loads, some of which I saw coming in to be checked, fully as large as the body of an ordinary carriage, but of course a mere trifle in the stupendous pile that the product of a year's work would make.

Broadly the manufacture is, one may say, divided into three sections; the first, that of the ordinary household

match, which ignites on any rough surface; the second, that of those well-cut safety matches which will ignite *only* on the box; and thirdly, that of the wax-lights, with which I may include the vesuvians. The general principle, however, on which the work proceeds is very nearly the same in all cases, so that the history of the cheapest differs little radically from that of the dearest match.

As to the safety match, I know not whether to admire most its simplicity of composition or the fact that it insures every household where it is exclusively used against that most terrible and unhappily, most common form of domestic calamity—fire. Instead of the *two* substances necessary for ignition, being *both* at the end of the match, *i.e.*, the phosphorus and chlorate of potash, the former only tips the stick, while the latter is confined to the box. By this truly ingenious contrivance, all chance ignition is rendered physically impossible, and the matches may be trodden on or grated to powder without the production of the faintest spark. When one remembers how common are those most awful of domestic calamities—household fires—not to mention wholesale tragedies of the Chicago kind, it really seems the merest fatuity that people should, as they still too often do, persist in rejecting an invention which must be regarded as emphatically beneficent, and as, in a word, a most economic form of domestic insurance. Considering how many lives are yearly lost by fire, remembering how many children have been cruelly destroyed through making a plaything of ordinary matches, I cannot but think that it would have been well if Mr. Lowe had proposed simply to tax all matches *except* those which *ignite only on the box*. We may be quite sure that, at any rate, all the fire offices would have been delighted, and probably the obvious public advantage to be derived from such an impost would have saved Mr. Lowe from going down to posterity as one of the most unpopular Chancellors of the Exchequer. At all events, I believe that ignorance, prejudice, and carelessness alone prevent the safety matches from entirely superseding, as they deserve to do, every other.

The factories are vast rooms divided longitudinally by benches, at which the workers stand, well lighted by day or night, and particularly lofty and well ventilated. The first rudiments of the matches enter the works in bundles of a thousand or two cut of such a length that each stick may form two matches when cut in the middle. These bundles

are heated on a plate and dipped in paraffine—a preparation that renders them inflammable and greatly improves their quality. It is necessary then that they should be dipped, and in order to perform this operation properly and with economy of time, a most ingenious adaptation of machinery is called into requisition. Along the sides of a vast room or hall are upright frames, the top of which is made in the form of a box, in which the short sticks of the future matches are placed by the girl whose duty it is to prepare them for dipping. At the bottom a grooved plate receives fifty in an even row, and by turning a handle these are thrust out in a line between the sides of the frame in which they are to be fixed. The girl immediately inserts a lath above them, repeats the former operation, obtains a fresh row of levelled sticks, inserts another lath, and continues the process until she has quite filled the frame, putting when necessary a fresh supply of sticks from the feeding-box above. When the frame is filled it is something like a large square cribbage-board stuck full of long pegs, which however project equally from both sides. The frame is now ready to be passed to the men and boys engaged in the working of "dipping." A man stands at a table with a hard level surface, on which he spreads the substance which forms the igniting end of the match, and which in the ordinary kind consists of chlorate of potash and phosphorus. Two little boys attend on him, armed respectively with a spoon and fork of, however, ogre-like dimensions. The former is to serve out the inflammable liquid, and the latter to collect any loose sticks that may cling to the composition, and twitch them into a large vessel at hand, where the liquid is drained off and used again, an economical provision highly necessary as the chemical part of the match is the most costly of all. Taking one of the frames I have just described in his hands, the dipper takes as it were an impression of both of its hairbrush-like sides in the paste beneath, smooths its surface and is immediately ready to repeat the operation as fast as the frames can be supplied. A few of the matches fall out during the process, and are, as I said above, twitched away to clear the table and save the chemicals employed. The "dipped" frames are at once deposited in the drying-racks, which constitute by no means the least striking part of these remarkable works. Imagine

a series of long narrow vaults with brick walls and iron doors at the sides, fitted up inside much as a cellar is with winebins. On each side, in successive parallel layers, are frames of matches drying, and as you can take quite a "constitutional" first and last along these curious avenues, I need not say I made no attempt to reckon up the probable number of matches which certainly seemed to give one a lively idea of population, for every few frames may be taken as representing so much civilized humanity. Saw-dust is strewn thickly along the floor, and this and the orderly nature of the arrangement gives the whole an air of cleanliness and neatness which is, to say the least, pleasing. As the reader may infer, fire is to be guarded against. Hence the saw-dust is to prevent friction, and the iron doors, directly a frame ignited, could be shut; while there are loop-holes in the brick walls through which water can play, from hose that I saw at regular intervals outside these singular cellars, like sentinels on duty.

The drying is expedited by a system of powerful fans which are worked by machinery, and greatly promote a free circulation of pure air throughout all the workrooms, to which the drying-racks are contiguous.

As soon as the matches are quite dry, they have to be cut and packed—two operations exclusively performed by girls of all ages, from mere children to grown-up women, and executed with an exactness, speed, and apparent ease which greatly excited my admiration. A knife attached by the point to a block, but moving from the handle freely up and down, works above a hollow; in it is the wooden bed just large enough to hold the necessary number of matches for the box to be filled. Taking a bundle of the two-ended matches, the cutter with one turn divides the whole, and with a single movement inserts half into the box, which is filled exactly in a manner which the looker-on may envy but feel he could never emulate.

I noticed the girls differed very much in age, and also in their rates of working, and on inquiry made haphazard along a considerable extent of working benches, found that these cutting and boxing hands earned variously from 10s. 2d. to 10s. 4d. a week up to 16s., the amount earned in a single week by one of the quickest "boxers" in the works. A good many made, for the same period, they told me,

about 9s. or 10s., but on farther inquiry I found most of them had lost a day or a half, and I think the average earnings of adult females is about 12s. 6d. weekly. As to the children there is evidently full scope given for emulative industry. One little girl had made 4s. 2d., and another, no bigger, I think, said with brightening eyes that she had earned 8s. At some of the benches, indeed, where the workers were principally children, the labour, which is, however, light, was further lightened by singing, which sounded very pleasantly, and well corresponded with the contented looks that everywhere met my view. I must now speak of the wax-lights—a very costly part of the manufacture. In a long, lofty building are at one side two drums occupying the opposite extremities of the room. Round these is wound the cotton, a large ball of which I examined and found of excellent quality. In the middle is a large vessel containing stearine, or wax in a liquid state, through which the cotton passes, so that as it winds over the drum it passes through and through the stearine becoming each time more thickly coated with the wax. These drums are turned by hand power, but Messrs. Bryant & May are applying steam power to this part of the operation—an advantage to the manufacturer, and a relief to the workers. As soon as the various wicks are sufficiently coated with wax, they are brought into connection with a cutting machine, which is as perfect a specimen of automatic work as can be seen anywhere, and soon fills a frame for dipping, which is performed as in the case of the ordinary matches. The filling the boxes is done by hand, but is a more delicate operation, as the wax cannot be manipulated like the wooden matches. Round one or two of the principal workrooms where the boxing is done are galleries whence a *coup d'œil* of the scene is very striking and not easily effaced from the memory. There are the long avenues of eager workers boxing at a lightning rate, and suddenly, as the eyes get dazzled with the long rows of gas lights, and the ears are deadened with the inarticulate hum from the busy hives below, a flame flashes up into that splendid brilliancy peculiar to phosphorus, and a smell of burning proclaims the untimely destruction of a handful of matches. During my walks round I saw this occur two or three times. It is impossible wholly to prevent the waste, unless by sacrificing the quality of the matches to a false economy. Really good matches when stuck point upwards together in such numbers and close propinquity, go off with

the least shock or at the smallest spark. No doubt the extreme annoyance that most of us have occasionally to submit to when we get hold of a box of matches that obstinately allow their inflammability to be triturated away in the most irritating darkness, is due to the short-sighted policy of makers who are afraid to dry their matches thoroughly lest they should fire prematurely at the frames.

I had heard much in common with most people of the very serious evils to which those engaged in this useful and necessary industry are exposed, from the effects of the phosphorus. Great, indeed, was my agreeable surprise to find first that there was not even an unpleasant flavour in the air, while neither the faces, nor, more significant still, the hands of any of the workers showed the least signs of suffering from contact with so powerful a chemical. Even the persons engaged in "dipping," and those who actually melt the phosphorus and stir it during ebullition were not only quite unscarred, but, apparently, enjoying excellent health, and on inquiring, I found that, though some of the hands had been at the works many years, in no case had a single day been lost from illness in any way traceable to the effects of what is popularly regarded as a rather dangerous thing to meddle with. "Keep your mouth shut, and your flesh clean," was the formula laid down by one of the men actually employed in preparing the phosphorus for use, and I cannot doubt that the whole of the evil which has sometimes resulted from this manufacture must have been due alone to close, ill-ventilated workrooms and dirty habits among the workpeople themselves. Fresh air, ample space, good treatment, and direct encouragement to cultivate neat as well as industrious habits, would, I doubt not, work a marvellous sanitary change for the better in some of our manufacturing centres, and render them, perhaps, worthy of comparison with the works of Messrs. Bryant & May.

Possibly some readers may not be aware of the nature of the matches that ignite only on the boxes—a match which, in the interest of everybody, should supersede every other. Ordinary matches are tipped with chlorate of potash and phosphorus. These, when brought in contact with emery paper or any rough surface, explode. By an ingenious thought Messrs. Bryant & May were led to perceive that by separating the two chemicals, and keeping one only on on the match and confining the other to the outside of the

box, a safety match would be produced. This proved practicable, and the safety matches are simply tipped with chlorate of potash, while the box is coated with the amorphous phosphorus. In so rapid a survey of such extensive works it is, of course, impossible to preserve anything like every important detail. The visitor for the first time is naturally bewildered to find everything connected with one of the minutiæ of daily life on so vast a scale. There are probably miles of wax tapers, and I should be afraid to say how proud a trophy of well-deserved victory might be built of match-boxes alone to form the only kind of monument that a certain Chancellor of the Exchequer would be likely to get were his claims for a monument decided by a *plebiscite*. In addition to supplying home-markets, Messrs. Bryant & May export vast quantities of matches, and a little circumstance connected with the wrappers struck me as very significant, showing as it does the radical difference between the English people and continental races. One is a pretty flower-pranked bank washed by a quiet pool of pellucid water, at the edge of which a girl reposes, while another is arranging her long hair, apparently by means of the natural mirror at her feet. The other picture represents a very sentimental young lady in a most picturesque attitude at the foot of what, I think, dramatists call a "practicable rock," gazing at a distant ship slowly vanishing on the far horizon. There can be no doubt that popular life in England suffers sorely from an almost total want of the necessarily softening and mind-enlarging influences of sentimental art. It is to be hoped that the asperities of the English character are yielding to better influences, and that the typical Briton of the lower classes will not always find

> That happiness is summed up here
> In horses, dogs, pipes, gin, and beer.

I observed in the new tin boxes of wax lights, intended for the waistcoat pocket, some very pretty designs. Several Chinese and Japanese varieties are highly commendable, and surely even the most rigid utilitarian may allow that the external prettiness of any useful article by rendering the mind of the user complacent, and contributing at least somewhat to the preservation of that excellent aid to labour of all kinds—a good temper—justifies the Platonic idea that

> Pure Good and Beauty are indeed the same,
> And differ not in essence but in name.